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INVESTIGATIONS

OF THE

Department of Psychology and Education

OF THE

UNIVERSITY OF COLORADO

ARTHUR ALLIN, EDITOR.

Medical Inspection of Schools

BY HOMER W. ZIRKLE, M. A.

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Published by the

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EDITORIAL.

With the present number, Volume I of the Investigations is concluded.

The first number on "Medical Inspection of Schools" endeavored to present the data on this subject in as complete a manner as possible. The work accomplished along this line in European countries and in America amply justifies the reform movement begun in all our progressive schools. The information gathered from every available source will, we hope, prove of much assistance to Superintendents and Principals who desire to introduce medical inspection into their school systems.

The second number, dealing principally with the "Survival Values of Play," is an attempt to arrive at the scientific value of play. Its place as an essential factor of the school curriculum can be regarded as once and for all time firmly established. Indirectly this investigation of play phenomena is an attempt to substitute scientific investigation for sectarianism in the field of pedagogy. Herbartianism and Froebellianism are interesting as historical stages, but can be regarded only as creeds more or less outworn. The second part of the same number dealt with the statistics of the growth and development of education in the Western States of the Union. Its rapid growth, its solid support on the part of the people, and its thoroughly democratic character were clearly evidenced by the facts adduced.

The third number dealt with the influence of various sociological and psychological movements on education. It was in a way a résumé of educational progress for the year, not from an administrative but from a scientific standpoint.

The present number has in view the need existing in many high schools of more extensive libraries for the use of students and teachers, the many and repeated requests from high-school authorities having led to its compilation. It does not claim to furnish a sufficient or a complete list of books, but additions and corrections may be added in a succeeding number. The various lists have been furnished largely by the professors of the University in the various departments, but special thanks are due to Prof. M. F. Libby, Prof. W. H. Nichols and Prof. F. A. Howe, for their courtesy and assistance.

THE EDITOR.

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I.

INTERDEPENDENCE OF THE MENTAL AND THE PHYSICAL.

Scientific research has of late years thrown much light upon the relation between physiological and psychical functions. (1) It has been conclusively shown that the mental and the physical are mutually interdependent.

That physical exercise produces mental fatigue, i. e., fatigues the nerve centres, and that mental exertion produces muscular fatigue is an established fact. This fact established physiologically, especially by Mosso, forms the basis for these views in reference to the relative amount of work which can be demanded of the human, and especially of the child, organism. Besides, Mosso, Key, Burgerstein, Laser, Höpfner, Kræpelin, Schmid-Monard, Binet and Henri, Griesbach and others have studied by different methods the point of time when fatigue commences in mental work. The majority of the methods applied by these investigators rests upon the supposition that certain bodily actions can not be performed in a state of mental fatigue, or that certain skin sensations of touch are less sharply defined in mental fatigue than in a state of mental freshness. These investigations have an intensely practical value, as they are already influencing the length of the periods of recitation, recreation, and the program as to the succession of studies, the time and method of training in the gymnasia, high schools, etc. Further investigation may soon solve the problem of how much mental exertion should be required of each age or period of development, that evil may not result from over-exertion at critical periods.

The amount of blood supplied to any organ is in proportion to the amount of work the organ has to perform. The brain is one of the most vascular organs in the body, and receives about one-fifth of all the blood supply of the body. An insufficient supply of blood to the brain detracts from its full power of cerebral action. When there is an increased supply the feelings are aroused, the thoughts are more free and rapid. In great mental excitement there is an increased supply of blood to the brain. Also powerful mental exertion causes a diminution of blood from the extremities of the body and a greater supply to the brain.

The quality of the blood is no less important than the quantity in relation to brain activity. It supplies nutriment and must possess all the elements necessary to cerebral activity that it may minister most efficiently to healthy brain life. Deleterious substances, such as narcotics, introduced into the blood, disorders that life and may totally destroy it. Feebleness

(1) The ordinary, empirical view of the relationship existing between mind and body is adopted in this discussion for practical reasons. Any metaphysical discussion would be obviously out of place.

of brain function is occasioned by anaemia, caused by insufficient food, indigestion, hemorrhages, over-work or disease. This anaemia is the poverty of the blood in red corpuscles which carry the oxygen of the blood.

Says Dr. J. Crichton Browne (1): "These corpuscles can now be readily counted in a given quantity of blood, and the degree in which they fall short of the standard of health can be estimated. That anaemia, however slight, is incompatible with good brain work is already an established fact, and it is to be hoped we shall soon be able to fix a point in anaemia beyond which no educational work should be attempted."

PHYSICAL DEVELOPMENT.

Since education is concerned with growth of mind, and growth of mind depends on growth of brain, and growth of brain on growth of body, it is all important to determine the laws which regulate physical development, and to know in what degree body growth may be taken as an index of cerebral development.

Factors of variation in stature and weight, aside from age and race, are nutrition, exercise, sanitation, occupation, climate and density of population. The limitations of a man's stature are probably determined by heredity, but these factors of variation determine whether he shall attain his full stature and weight. This seems conclusive from a comparison of the statistics which follow.

TABLE I.

Adapted from Roberts' Tables in His Work on Anthropometry, Showing the Average Height and Weight and Annual Rate of Increase of 7,709 Boys between the Ages of 10 and 20 Years, of the Most Favored Classes of the English Population—Public School Boys, Naval and Military Cadets, Medical and University Students.

Age	Height without Shoes. Average	Growth	Weight including Clothing. Average	Growth
Last Birthday.	Inches.	Inches.	Lbs.	Lbs.
10	53.40	.....	67.4	.....
11	54.91	1.51	72.9	5.50
12	56.97	2.06	80.3	7.39
13	58.79	1.82	88.6	8.27
14	61.11	2.32	99.2	10.61
15	63.47	2.36	110.4	11.21
16	66.40	2.93	128.3	17.92
17	67.84	1.46	141.0	12.69
18	68.29	.43	146.0	4.97
19	68.72	.43	148.3	2.20
20	69.13	.41	152.0	3.87

(1) In Morris' Book of Health, Chapter on Education and the Nervous System, p. 291.

TABLE II.

Adapted from Roberts' Tables, Showing the Average Height and Weight and the Annual Rate of Increase of 7,855 Boys between the Ages of 10 and 20 of the Artisan Class—Town Population.

Age	Height without Shoes. Average	Growth	Weight including Clothing. Average	Growth
Last Birthday.	Inches.	Inches.	Lbs.	Lbs.
10	50.52	.....	66.31	.....
11	51.52	1.00	69.46	3.15
12	52.99	1.47	73.68	4.22
13	55.93	2.94	78.27	4.59
14	57.76	1.83	84.61	6.34
15	60.58	2.82	96.79	12.18
16	62.93	2.35	108.7	11.93
17	64.45	1.52	116.4	7.66
18	65.47	1.02	123.3	6.97
19	66.02	.55	128.4	5.08
20	66.31	.29	130.6	2.20

A comparison of Roberts' tables of the artisan and well to-do classes shows that the average height difference between the two classes varies between the ages of 10 and 20 from 2.82 inches to 3.98 inches, being least at the ages of 10 and 20 and greatest at 12, 16 and 17. The laboring class not only gains less annually, but is slower in gaining the increase by about one year.

In weight the difference between the two classes is at 10 years 3.44 pounds, which gradually increases till it reaches 25.6 pounds at the age of 17. The same corresponding superiority of the most favored class in chest-girth is shown by Dr. Roberts' tables to increase progressively till adult life.

This remarkable difference is due, perhaps partly to heredity, but more to the less favorable conditions of food, exercise and sanitation on the part of the laboring classes in large cities.

Dr. Roberts' tables also show that children and youths of the professional classes living in the country exceed those of the same classes living in towns by about one inch in height at all ages from 10 to 20, and in an amount varying progressively from 1 to 7 pounds in weight. Dr. Roberts has also collected tables showing the heights and weights of idiots and imbeciles in English public institutions. These show considerable inferiority to the class of artisan and factory operatives.

Key, comparing the curves of development in American, English and Swedish children, concludes that "the weak period of development before puberty is lengthened for the poorer children." This confirms Roberts' report, which shows the increase to be about one year later in the artisan class than in the well-to-do class.

Cowell (1) of England in 1833 compared 1,062 factory children and 228 others in more favorable circumstances and draws the same conclusion.

BOWDITCH'S TABLE.

Age.	Height (in.) Favored.	General	Difference.	Weight (lbs.) Favored.	General	Difference.
10.....	53.51	51.68	1.83	70.6	65.36	5.24
11.....	54.96	53.33	1.63	75.3	70.18	5.12
12.....	56.78	55.11	1.67	85.9	76.92	8.98
13.....	59.60	57.21	2.39	94.4	84.84	9.56
14.....	61.51	59.88	1.69	99.9	94.91	4.99
15.....	64.20	62.36	1.84	116.6	107.10	9.50
16.....	65.83	65	.83	125.8	121.01	4.79
17.....	67.44	66.16	1.28	135.2	127.49	7.61
18.....	67.44	66.66	.78	138.2	132.55	5.65

Bowditch's table shows a comparison of the average heights and weights of a favored class and all the population of Boston averaged together. The favored class were selected to correspond to the class of England who attend the public schools and universities.

It will be observed that those whom Dr. Bowditch has selected as the favored class as regards the comforts of life exceed the average of the whole population in height, varying from .78 of an inch to 2.39 inches, and in weight ranging from 4.79 pounds to 9.56 pounds, in weight and stature being greatest at the age of 13. As the "general" includes the favored as well as the poor, it is plain that the real difference is even greater than that shown in the table. Dr. Bowditch concludes that "Deprivation of the comforts of life has a greater tendency to diminish stature than the weight," and "that the importance of mode of life as a factor in determining the size of growing children in this community is at least equal to and possibly even greater than that of race."

A comparison of the children in the city schools of Moscow (2) with factory children of the same city shows the following differences in centimeters in favor of the school children:

Age.....	9	10	11	12	13	14	15	16	17
Boys.....	4	4.6	5.7	5.7	7.7	9	9.7	8.7	5.4

A comparison by the same author of school girls and factory girls gives the following figures in centimeters:

Age	8	9	10	11	12	13	14	15	16
School girls...	116.4	119.6	125	129.7	132.9	138.3	145.8	146.4	150.3
Factory girls..	118.8	123.6	129.5	131	135.5	139.9	143.4	148.2	151

This shows a decided superiority in stature for the factory girls.

(1) Burk, "Growth of Children," American Journal of Psychology, Vol. 9, April, 1898, page 272.
(2) Burk, "Growth of Children," American Journal of Psychology, Vol. 9, page 276.

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Pagliani (1) compares the girls in a private school in Turin, Italy, with those of charity girls. At the age of 15 the charity girls are in weight an average of 37.1 kg., the school girls 45.6 kg. In stature the school girls are also ahead.

The following table by Weissenberg shows that the poor are less in height and weight than the wealthy and middle classes.

WEISSENBERG'S TABLE. (2)

AGE	Length of Body			Weight of Body			Strength of Lift		
	Poor	Middle Classes	W'lthy	Poor	Middle Classes	W'lthy	Poor	Middle Classes	W'lthy
	Cm.	Cm.	Cm.	Kilos.	Kilos.	Kilos.	Kilos.	Kilos.	Kilos.
10 years.....	124.2	124.7	125.6	25.95	25.69	36.2	36.2	34.6	32.1
11 "	125.9	128.9	131.5	26.99	27.29	27.28	40.1	40.7	40.1
12 "	130.8	135.5	137.8	29.03	30.75	31.97	49.4	54.2	53.2
13 "	133.3	137.7	140.4	32.23	33.34	34.74	54.5	60.8	60.5

(3) "According to Liharzik, growth is regular, and all deviation tends to produce disease, as disease also produces deviation. A large head is frequently accompanied with a contracted chest; here mental action may be slow—probably from deficient supply of purified blood. Boys of small frames often have rather large heads and are deficient in repose of character. City-bred children are usually more vivacious, but have less power of endurance than children reared in the country."

The late report of the anthropometric committee of the British Association for the Advancement of Science gives the results of observations of over 50,000 individuals. This report shows that in boys from 11 to 12 years of age there is a difference of about 5 inches in the average height between the worst and best matured classes in the community.

Dr. Paul Hasse, in 1880, measured 2,806 children in Gohlis-Leipzig—1,386 boys and 1,420 girls. Says Dr. MacDonald (4) of this investigation: "Comparing the poor with the well-to-do classes, the results show that for boys of the same age the height varies from .7 to 4 centimeters in favor of the well-to-do classes; for girls it varies from 1.7 to 4.1 centimeters in favor of the well-to-do. The children of the well-to-do classes excel also in weight for the same age; for boys the excess runs from .3 to 4.7 pounds; for girls from 1.6 to 4.6 pounds."

Hasse also found that the weak or defective children, who could not attend school regularly, were usually abnormally developed or had some chronic ailment. About 9 per cent. of the children in the primary schools belonged to this class. Many of these children in certain years were taller and heavier than the average. Dr. Crichton Browne also suggests that there is reason for alarm when a child greatly exceeds the normal growth, as well as when he falls far short of it.

(1) Burk, "Growth of Children," American Journal of Psychology, Vol. 9.
(2) Arthur MacDonald, "Growth and Sociological Conditions." Reprint from Boston Medical and Surgical Journal, Sept. 14, '99.
(3) Ibid.
(4) Ibid.

The Anthropometric Committee of England in their report of 1893 gave the height and weight of the inmates of the Swinton Industrial School of England. These children "represent the most unfavorable condition of life and heredity." Compared with boys of Roberts' most favored class, these boys are shorter by 3.31 inches and lighter by 10.64 pounds at the age of 10; at the age of 14 they are 6.65 inches shorter and 21.85 pounds lighter.

RELATION OF SIZE TO PRECOCITY AND DULLNESS.

The foregoing reports conclusively show that mode of life, exercise and sanitary conditions largely determine the stature and weight of a growing child. There seems also to be a direct relation between physical growth and mental development.

Dr. Townsend Porter (1) tabulated weights and heights of 34,500 boys and girls of the St. Louis schools, from the kindergarten to the high schools, inclusive. He concludes that on the average precocious children are heavier and taller than their duller fellows of the same age. He compared the mean weight and height of pupils of a given age with the average weight and height of pupils of the same age found in the different grades. Thus he found that the mean weight of boys of 12 years is 73.61 pounds.

The average weight of the boys of the same age found in the I. grade is 70, in the II. 69.50, in the III. 72.17, in the IV. 73.86, in the V. 74.69, in the VI. 77.29, in the VII. 76.50. The mean weight of girls at the age of 13 is 83.73. The average weight of those 13 years old found in the II. grade was 79.50, in the III. 76.50, in the IV. 81.92, in the V. 82.78, in the VI. 86.95, in the VII. 87.63, in the VIII. 88.50.

The Department of Child Study and Pedagogic Investigation of the Chicago public schools, in 1899-'00 (2), weighed, measured and tested with reference to their physical powers 497 pupils of the age of 12, found in the various grades. The great number of pupils included in this table still more forcibly confirms the parallelism between physical superiority and mental capacity.

TABLE OF TWELVE-YEAR-OLD PUPILS BY GRADES OF THE CHICAGO PUBLIC SCHOOLS.

GRADE	No. Ex.	Av. Age.	Av. Ht. mm.	Av. Wt. kg.	Av. Erg. kg.-cm.	Av. Strength of Grip. Right Hand. kg.	Av. Strength of Grip. Left Hand. kg.	Av. Vital Capacity. cu. cm.
II	4	12-3-28	1333	29.513	233	16.75	16.50	1488
III	19	12-5-23	1377	33.592	248.7	20.03	18.55	1732
IV	84	12-5- 2	1403	34.972	271.3	20.22	18.85	1742
V	134	12-5- 9	1422	35.596	268	21.06	19.64	1790
VI	143	12-5-20	1443	36.136	271	21.40	20.12	1887
VII	95	12-6-13	1451	37.150	283	22.31	20.41	1947
VIII	18	12-6-29	1443	38.453	318.6	23.31	21.07	3053

(1) Burk, "Growth of Children," American Journal of Psychology, Vol. 9, April, 1898, page 295.

(2) Reprint of Report of Department of Child Study and Pedagogic Investigation, 1900, pages 35 and 36.

Dr. John Punton (1), who made extensive investigations as to health and measurements of pupils in the Kansas City high school, is of the opinion that to take the age of a child as a criterion of its mental strength and capacity is very erroneous, and that it is far more logical and scientific to allow the height and body weight of a pupil to govern this important question.

The anthropometrical investigations that have thus far been made in the schools seem to be unanimous in the verdict that the mental development of a pupil is directly related to his height, weight and physical measurements, and that there is a physical basis for precocity on the one hand and mental dullness on the other.

It does not necessarily follow that small men are mentally duller than large men. For it seems that every individual has his limitations of size fixed by heredity from birth. If this size is attained in its fullness the individual has had his normal development; if stunted, he is mentally duller than he should have been.

Nor does it follow that this is always true in every individual case. It frequently occurs that the smallest and the youngest pupil in the class is the brightest intellectually. These are exceptions to the general rule, constituting a type by themselves, and should afford subjects for special study by the school physician, who should always be psychologist as well as physician.

Dr. Tarbell (2) of the Boston Home for the Feeble-Minded, measured and weighed the inmates of that institution, ranging in age from 6 to 19 years, and found that the average height was about two inches shorter than the normal height of children of the same age, and their weights about nine pounds less. Dr. G. E. Shuttleworth (3) of England collected the weights and measurements of 1,209 idiots and imbeciles of English asylums and found that they confirmed the report of Dr. Tarbell. Dr. Shuttleworth makes a similar report of 300 idiotic and imbecile children and finds them to have been shorter than normal children by one inch at 5 years, two inches at 10 years, three inches at 15 and 20 years. They were lighter in weight by 4½ pounds at 8 years, by 6 pounds at 10 years, by 8 pounds at 15 years, and by 23 pounds at 20 years.

These figures seem to show conclusively that there is a relation between healthy physical growth and mental development.

Combe (4) of Lausanne gives data on 2,000 school children covering a period of six years from the age of 9 to 15. He included all afflictions—acute and chronic. The percentage of sickness for boys ranges from 64 per cent. in the 9th year to 29 per cent. in the 14th year, fluctuating between

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(1) "Relation of the Science of Medicine to Public School Education." Read before the Tri-State Medical Society at St. Louis, April 8, 1897.
(2) Burk, "Growth of Children," American Journal of Psychology, Vol. 9, page 298.
(3) Ibid, page 299.
(4) Ibid, page 289.

these points from the 9th to the 15th year. His percentage for girls is as follows: 88 per cent. in the 9th year, 75 per cent. in the 10th year, 60 per cent. in the 11th year, 68 per cent. in the 13th year, 61 per cent. in the 14th year, and 39 per cent. in the 15th year.

Schmid-Monard's (1) observations of several thousand pupils of Halle show from 5 per cent. to 10 per cent. less of sickness among boys than girls, and that sickness varies according to kind of schools, social condition of pupils and age. Averaging these he finds that the number sick of boys ranges from 18 to 30 per cent., and of girls from 27 to 40 per cent.

DR. FRANCIS WARNER'S STUDY OF CHILDREN. (2)

In 1888 a committee was appointed by the British Medical Association to study school children as to their mental and physical status. As a result of this committee's work 100,000 children were examined individually upon a fixed plan, taking a written description and a schedule for each child in any point subnormal, or reported by the teacher as dull or backward.

Dr. Francis Warner, who was the leading member of this committee, from these investigations deduces the following propositions concerning childhood:

I. The main classes of defect among school children include a larger proportion of boys than girls.

II. The main classes of defect among school children are much associated in groups of cases; such associations vary with sex, age and environment.

III. Children with developmental defects often present also abnormal nerve signs and are delicate and dull.

IV. Children with indications of brain disorderliness, i. e., abnormal nerve-signs, are often dull pupils.

V. Dull pupils are often delicate, with indications of brain disorderliness; i. e., abnormal nerve-signs.

VI. Girls with developmental defects or brain disorderliness are more apt to receive harm and less good from their environment than boys.

VII. The effects of good physical training in schools are to diminish the number of cases with signs of brain disorderliness and number of dull children (3).

(1) Burk, "Growth of Children," American Journal of Psychology, Vol. 9, page 289.

(2) Warner's Study of Children, Macmillan, 1898.

(3) Ibid, pages 230 ff.

SELECTED FROM WARNER'S TABLE VII. (1)

Based on 50,000 Children Seen in Day Schools, mostly in or near London (1892-1894); viz., 26,287 Boys, 23,713 Girls. Showing the Total Number of Children with each Main Class of Defect and Groups of Defect, and the Percentage on the Number of Children Seen of all Ages.

Main Classes of Defect and Groups of Defect.	Number in Groups.		Percentage on Number of Children Seen.	
	Boys.	Girls.	Boys.	Girls.
All children with developmental defect...	2,308	1,618	8.8	6.8
All children with abnormal nerve signs...	2,853	2,015	10.8	8.5
All children with low nutrition.....	749	770	2.8	3.2
All children mentally dull.....	2,074	1,634	7.9	6.9
All children with some defect not included in groups above.....	336	323	1.2	1.3

WARNER'S TABLE VIII. (2)

Based on 50,000 Children Seen in Day Schools, mostly in or near London (1892-1894); viz., 26,287 Boys, 23,713 Girls. Showing the Co-Relation or Association of the Main Classes of Defect Observed in Children.

The table is arranged in four columns, giving the percentages for children in the age groups and at all ages. The percentages are taken on the number with the main class of defect.

Thus: Of all cases with development defect at all ages, 38.4 per cent. of the boys and 49.9 per cent. of the girls were mentally dull.

Of all the dull children at all ages, 57.6 per cent. of the boys and 52.6 per cent. of the girls also presented abnormal nerve-signs.

(1) Warner's Study of Children, page 249.
(2) Ibid, page 250.

TABLE VIII.

	7 Years and Under.		Age 8-10.		Age 11 and Over.		All Ages.		
	Boys.	Girls.	Boys.	Girls.	Boys.	Girls.	Boys.	Girls.	
				A					All cases with developmental defect, B. 2,308, G. 1,618.
AB	31.7	28.5	43.3	41.4	40.5	44.0	38.4	36.2	Per cent. with abnormal nerve-signs.
AC	22.7	35.0	16.0	22.1	7.5	15.0	16.2	26.3	Per cent. with low nutrition.
AD	36.6	40.8	41.2	46.6	37.1	51.1	38.4	44.9	Per cent. with mental dullness.
				B					All cases with abnormal nerve-signs, B. 2,853, G. 2,015.
AB	35.1	42.2	30.6	28.0	28.3	21.4	31.0	29.1	Per cent. with developmental defect.
BC	19.6	27.4	11.3	15.2	7.5	10.2	12.3	16.6	Per cent. with low nutrition.
BD	43.3	47.0	42.6	41.9	39.6	40.4	41.8	42.6	Per cent. with mental dullness.
				C					All cases with low nutrition, B. 749, G. 770.
AC	52.5	66.1	51.0	50.4	39.3	35.5	49.9	55.5	Per cent. with developmental defect.
BC	41.1	36.0	51.1	51.1	56.4	49.9	47.1	43.5	Per cent. with abnormal nerve-signs.
CD	43.6	42.0	44.8	40.7	37.6	35.6	43.1	40.5	Per cent. with mental dullness.
				D					All dull children, B. 2,077, G. 1,635.
AD	45.9	55.1	43.3	42.6	38.6	34.9	42.8	44.4	Per cent. with developmental defect.
BD	49.0	44.1	63.4	56.6	59.1	56.7	57.6	52.6	Per cent. with abnormal nerve-signs.
CD	23.6	30.1	14.8	16.3	7.5	10.2	15.5	19.0	Per cent. with low nutrition.

Dr. Punton of Kansas City examined 400 pupils, 200 boys and 200 girls, of the Kansas City high school, as to health, physical defects and measurements. He says: "We selected at random from the general assembly hall of the high school 200 boys and a similar number of girls, whose ages ranged from 13 to 21, and subjected them to similar examinations as pursued in other large schools. Our investigations proved conclusively that out of 200 boys 34 per cent. were found to possess a nervous temperament, as demonstrated by either a history of direct inheritance or the character of the pulse, and 35 per cent. of these were found to be subject to physical defects. When the measurements of these nervous children are compared with Dr. Sargent's chart of Boston boys of the same age, we find that the weight of our boys was 6.3 pounds less, and the height .9 of an inch less than that of the Boston boys, while the heart rate was also six beats per minute faster.

Not only were these nervous children found to be deficient in weights and measurements, but the general average of all the boys examined was found to be in nearly every instance deficient in weight, height and other vital measurements. For instance, the average weight of the Kansas City high school boy at the age of 16 is 126 pounds, against 132.3 pounds of the Boston boy, while the average height of the Kansas City boy is 5 feet 6.7 inches, as against 5 feet 7½ inches of the Boston boy, a clear loss of .8 of an inch. Again, the girth of the neck, which is considered one of the most vital measurements of the body, was also deficient. Besides this, the breadth of the shoulders was found to be deficient to the extent of .8 of an inch. The expansion of the chest, which is also a valuable guide to lung capacity, was found to be half an inch less than in the Boston boys of the same age.

Nervous force, which was measured by the dynamometer, we found to be equal with that of the eastern boys of the same age, which would suggest, at least in view of all the other deficiencies, that our own boys were using more nervous force at the expense of their physical strength than are their Boston friends. The average heart beat of nine-tenths of the boys examined in our high school was 84, which is entirely too rapid for health, and is in itself an indication of physical weakness." (1).

(1) "The Relation of the Science of Medicine to Public School Education," by John Punton, M. D. Read before the Tri-State Medical Society at St. Louis, April 8, 1896.

TABLE

Showing a Comparison of the Heights and Weights of Pupils in the Kansas City High School, by Superintendent Greenwood, with Pupils of the Boston High Schools, by Dr. Sargent of Harvard.

Age.	K. C. Weight.	Height.	Boston Weight.	Height.
14.....	92.2 lbs.	4 ft. 10.5 in.	99½ lbs.	5 ft. 2 in.
15.....	107.3 lbs.	5 ft. 2.8 in.	112 lbs.	5 ft. 5 in.
16.....	119 lbs.	5 ft. 3.9 in.	132 lbs.	5 ft. 7.5 in.
17.....	136.6 lbs.	5 ft. 4.8 in.	134½ lbs.	5 ft. 7.6 in.
18.....	136.8 lbs.	5 ft. 6.6 in.	135 lbs.	5 ft. 7.8 in.

In 1899 Dr. Christopher (1) of Chicago, assisted by others, made some very interesting observations on Child Study and Scientific Pedagogy. Most of these investigations were made in the Alcott school. This school was selected because it contained pupils that may be called normal—such as are well fed, well clothed, and the great majority being of American birth. There were over 1,200 pupils tested.

The scope of the investigations may be shown by the following card, on one of which were recorded the tests for each individual pupil:

No.....

Name..... Sex.....

School..... Grade.....

Teacher .....

.....

Birthday—Year..... Month..... Day.....

Age—Years..... Months..... Days.....

School standing .....

Attention .....

Memory .....

Grasp of work .....

Best work is in .....

Deportment .....

.....

Date .....

(1) Forty-fifth Annual Report of the Board of Education, Chicago, for the year ending June, 1899, pages 27-75.

Height with shoes .....
Height of heel .....
Net height .....
Height sitting .....
Weight with clothes .....
Weight of clothing, est. .....
Net weight, est. .....
Ergograph—Hour .....
Weight used .....
Centimeters traveled .....
Work—Centm. grams .....
Fatigue commences—sec .....
Duration of work .....
Dynamometer, R .....
Dynamometer, L .....
Lung capacity .....
Audiometer, R .....
Audiometer, L .....
.....

All the tests made were by the most improved scientific methods and were carefully done. The results of these investigations are graphically shown in a series of tables and charts of norms, or averages, which appear quickly to the eye. Mosso's ergograph, slightly modified by Mr. F. W. Smedley, was used for collecting data on the phenomena of fatigue and endurance. Tests were made on the same pupils at intervals of about three-quarters of an hour during the school day. From these ergographic tests the following conclusions were drawn:

1. The extremes of endurance and fatigue in school are greater in the morning than in the afternoon.

2. A higher grade of power is found in the morning session in children attending two sessions daily.

3. While endurance is not as great, it is better sustained in the afternoon.

In summing up in a general way the conclusions that may be drawn from these data, Dr. Christopher says:

"While many interesting deductions might be made from the foregoing observations, I deem it best to present only the following conservative conclusions, which I believe are fully justified by the observations:

"1. In general there is a distinct relationship in children between physical condition and intellectual capacity, the latter varying directly as the former.

"2. The endurance (ergographic work) of boys is greater than that of girls at all ages, and the difference seems to increase after the age of nine.

"3. There are certain anthropometric indications which warrant a careful and thorough investigation into the subject of co-education in the upper grammar grades.

"4. Physical condition should be made a factor in the grading of children for school work, and especially at the entrance into the first grade.

"5. The great extremes in physical condition of pupils in the upper grammar grades make it desirable to introduce great elasticity into the work of these grades.

"6. The classes in physical culture should be graded on a physical instead of an intellectual basis."

Being convinced of the importance of these investigations by Dr. Christopher's committee, the Board of Education (1), on September 6, 1899, established an independent department for Child Study and Pedagogic Investigation. Mr. F. W. Smedley was appointed director of the department, with several assistants. The objects and functions of the department are set forth as follows:

I. Research work—
   a. Collecting anthropometric and psycho-physical data for the purpose of establishing norms, and for determining such relationships as may be of service in pedagogy.
   b. Applying accurate scientific methods to specific pedagogic problems, particularly methods of teaching and determination of the pedagogic value of various studies.

II. Examination of individual pupils with a view to advising as to their pedagogic management.

III. Instruction to teachers in child study and psychology.

This we believe to be a great step in the right direction. The state undertakes the task of educating its children, and as it practically monopolizes elementary instruction, it seems proper that the state should promote the advancement of pedagogic knowledge.

This is probably the only public board of education that has ever established, under its charge and direction, a separate department for pedagogic research. Scientific child study with reference to pedagogy in its infancy, so to speak. We are in the main blindly following tradition rather than the results of scientific research on this most important subject. A great part of the work done so far on the subject of child study has been unscientific and unskillful, and therefore worthless. Other boards of education in our large cities ought to follow the example of the Chicago board and establish departments for research along special lines. The sum total of the results obtained would be far reaching. Norms on all phases of child life could soon be established, which would serve as a positive criterion for child development.

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(1) Reprint of the Report of the Department of Child Study and Pedagogic Investigation, from Annual Report of Board of Education of Chicago, 1899-1900.

The department thus established continued the work begun by Dr. Christopher and still more positively established the conclusions already reached. Among many other things these investigations show that the pupils with normal physical development have a higher school standing than their classmates less developed. The average of those at or above grade is superior to the average of those below grade in height, weight, ergographic work, strength of grip and lung capacity, as is shown in the following table:

PHYSICAL DEVELOPMENT AND SCHOOL TRAINING.

Boys.

Age	NUMBER TESTED	Average Age	Height Stand'g mm.	Height Sitting. mm.	Weight. kg.	Ergograph. kg.-cm.	Right Grip. kg.	Left Grip. kg.	Vital Capacity. cu. cm.
8	At and above grade.....210	8-5-25	1238	679	25.286	170.1	13.46	12.49	1395
	Below..... 45	8-4-12	1210	667	23.790	155.2	12.05	11.68	1353
9	At and above grade.....151	9-6-21	1300	702	27.907	209.4	16.12	15.32	1588
	Below..... 77	9-5-2	1264	692	26.787	198.2	14.59	13.66	1472
10	At and above grade.....158	10-6-1	1340	717	30.258	240.5	17.84	16.62	1670
	Below..... 96	10-5-25	1314	707	29.145	225.7	17.42	16.52	1642
11	At and above grade.....125	11-6-23	1376	731	32.814	270.6	20.05	18.64	1828
	Below.....103	11-5-25	1363	727	32.180	264.1	19.82	18.82	1766
12	At and above grade.....130	12-6-10	1436	754	36.843	306.6	23.38	21.44	2063
	Below.....126	12-5-4	1399	740	34.370	286.2	21.38	19.70	1844
13	At and above grade.....117	13-6-18	1500	782	41.470	372.4	27.42	24.98	2334
	Below.....113	13-5-1	1475	771	39.040	341.5	25.07	23.38	2163
14	At and above grade.....146	14-6-3	1564	815	46.218	437.3	30.69	28.31	2638
	Below.....104	14-5-2	1520	793	42.775	404.9	29.13	27.05	2360
15	At and above grade.....125	15-5-26	1622	843	51.394	507.8	36.64	33.54	2978
	Below..... 80	15-5-23	1599	827	50.369	515.9	35.79	33.40	2749
16	At and above grade..... 77	16-5-28	1689	881	58.246	606.8	43.21	39.86	3542
	Below..... 69	16-4-25	1637	859	53.289	575.7	40.90	37.69	3165
17	At and above grade..... 46	17-5-14	1702	897	60.417	654.	47.57	43.60	3646
	Below..... 46	17-5-24	1677	884	58.069	648.7	46.23	41.89	3495
18	At grade 23	18-5-27	1737	917	60.971	670.	50.53	44.82	3644
	Below..... 17	18-4-3	1726	911	64.252	723.8	51.41	48.17	3741

Girls.

8	At and above grade.....187	8-6-10	1236	677	24.373	147.4	11.89	11.16	1238
	Below..... 45	8-4-26	1195	662	22.424	120.2	10.73	10.08	1113
9	At and above grade.....156	9-6-15	1283	693	26.862	174.9	13.94	12.97	1381
	Below..... 65	9-4-29	1266	688	25.769	163.	13.77	13.12	1308
10	At and above grade.....157	10-6-5	1330	711	29.289	193.4	15.61	14.62	1452
	Below..... 83	10-4-5	1308	704	28.365	183.8	14.91	13.98	1465
11	At and above grade.....121	11-5-25	1390	738	32.651	223.7	18.04	17.16	1611
	Below.....102	11-5-5	1370	731	31.516	219.3	17.	15.87	1560
12	At and above grade.....132	12-5-27	1456	767	36.655	252.4	20.38	19.12	1763
	Below.....115	12-5-10	1423	756	35.958	244.2	19.77	18.69	1675
13	At and above grade.....154	13-7-3	1526	803	42.673	296.3	23.94	22.10	1939
	Below.....101	13-5-13	1492	788	40.036	291.8	23.08	21.60	1901
14	At and above grade.....226	14-6-20	1572	833	48.060	347.6	26.41	24.22	2160
	Below..... 75	14-5-23	1539	802	44.532	332.9	25.53	23.81	1986
15	At and above grade.....314	15-6-9	1576	842	49.745	360.7	28.09	25.96	2255
	Below..... 65	15-4-24	1564	831	47.413	336.2	27.09	25.07	2083
16	At and above grade.....182	16-6-19	1599	855	53.091	389.3	30.01	27.79	2340
	Below.....172	16-4-23	1584	848	50.773	405.7	28.95	26.80	2267
17	At and above grade.....132	17-5-29	1602	855	53.039	373.4	29.97	27.23	2331
	Below.....119	17-5-1	1590	851	51.663	366.5	29.23	26.97	2274
18	At grade 63	18-5-2	1597	856	53.214	387.2	30.15	27.84	2396
	Below..... 74	18-4-19	1594	858	52.846	376.7	29.57	27.69	2311

COMPARISON OF THE JOHN WORTHY AVERAGES WITH THE NORMS.

A comparison of the John Worthy (1) pupils with the normal pupils shows the John Worthy pupils to be inferior in all the principal measurements, and the inferiority increases with age.

Net Height.

Age.	John Worthy No.	John Worthy Average.	Normal.	Per Cent John Worthy Is of Normal.
		mm.	mm.	
9	2	1312	1289	101.78
10	10	1303	1330	97.97
11	24	1335	1370	97.45
12	54	1378	1418	97.19
13	47	1435	1488	96.44
14	65	1458	1546	94.32
15	51	1518	1613	94.04
16	24	1535	1665	92.19
17	7	1573	1690	93.07

Height Sitting.

		mm.	mm.	
9	2	704	699	100.77
10	10	710	713	99.57
11	24	715	729	98.07
12	54	736	747	98.52
13	47	755	777	97.04
14	65	771	806	95.65
15	51	774	837	92.47
16	24	795	871	91.27
17	7	819	891	91.91

Weight.

		kg.	kg.	
9	2	29.075	27.616	105.28
10	10	30.333	29.837	101.63
11	24	31.527	32.519	96.95
12	54	34.723	35.626	97.47
13	47	38.366	40.276	95.26
14	65	39.287	44.786	87.72
15	51	44.671	50.994	87.60
16	24	45.109	55.219	81.69
17	7	48.079	59.343	81.15

(1) The John Worthy school is a school conducted by the Board of Education for the boys under sixteen who are committed to the bridewell by any of the justices, or police, or criminal court judges of the city of Chicago.

Ergographic Work.

		kg.-cm.	kg.-cm.	
9	2	144.4	205.6	70.03
10	10	198.4	235.0	84.51
11	24	211.9	267.7	79.15
12	54	235.4	297.8	79.04
13	47	294.6	359.2	82.01
14	65	300.0	423.8	70.78
15	51	349.2	513.5	68.00
16	24	366.3	584.7	62.64
17	7	422.9	651.4	64.92

Vital Capacity.

		cu. cm.	cu. cm.	
9	2	1675	1549	108.13
10	10	1673	1659	100.81
11	24	1694	1799	94.11
12	54	1953	1956	99.85
13	47	2098	2246	93.40
14	65	2203	2527	87.16
15	51	2409	2858	84.21
16	24	2541	3363	75.14
17	7	2750	3570	77.03

The anthropometrical measurements and comparisons given in this paper conclusively show that a man's stature is somewhat modified by environment and that mental development on the whole depends, in a measure at least, on the healthy, normal development of the body. It is an accepted truth that the work required of the pupil of average strength can not be done without injury by the pupil of less than the average strength. It should be the duty of the school physician to determine the cause of the weakness, whether it be from lack of nutrition, bad sanitation, sickness, or what not, and to suggest the remedy. By these anthropometrical measurements and medical inspection the pupils could be classified with respect to their physical abilities, placing those together who are physically able to do, without injury, the full amount of school work of their age; and making another division for those whose physical development makes it probable that they can not do this work without injury, and who, therefore, demand special care and watchfulness.

There is need of further investigations along this line. The statistics that have as yet been collected bearing on normal growth and development are few and not of the most satisfactory sort. These statistics have usually been collected from large numbers of children of a corresponding age, regardless of previous conditions of health, thus averaging the unhealthy with the healthy. More satisfactory conclusions could be obtained by collecting data from the same children extending through the period of their growth.

Every child on entering school should bring with it a certificate with brief statements of the diseases it has had, its general constitution, condition of eyes, ears, vertebral column, height and weight of body. This certificate should form the basis for the further observation of the child by the school physician.

In addition to the items usually kept in a school register, the following particulars should be inscribed:

1. Birthplace.
2. Nationality of parents.
3. Occupation of parents.
4. Causes of death and ages at death of parent or parents.
5. Height.
6. Weight.
7. Girth of chest.
8. Circumference of head.
9. Strength of arm.
10. Power of sight.
11. Power of hearing.
12. Breathing capacity.
13. Previous and hereditary diseases.
14. Imperfect development and deformities.

PHYSICAL DEFECTS.

Says Walter E. Magee, director of physical culture, University of California (1): "All acquired and many hereditary deformities can be remedied in the majority of cases by a systematic physical culture during the first twelve years of school life, but they are exceedingly hard to remedy when the pupil arrives at university age."

The defects commonly found in every school are the following: Head drooping forward, round shoulders, flat chest, and stooping, pigeon breast, loss of lumbar curve and lateral curvature of the spine, and hips too far forward.

Magee examined the pupils of a representative girls' school of San Francisco, and found that "33 per cent. were suffering from curvature of the spine, one-third of whom had entirely lost the lumbar curve, thus producing a corresponding deformity of the chest and shoulders; 50 per cent. required special work for flat or hollow chests or pigeon breasts, while only 17 per cent. could be permitted to take regular exercise without special work. Many of these deformities were not serious, but, nevertheless, they existed, and, had they not been taken during the growing period, would have certainly resulted seriously."

Says Dr. Hitchcock (2) of Amherst College: "We do not find more than one student in twelve who is defective when he enters, save in sight, or

(1) Northwestern Monthly, July, 1897, page 11.
(2) Northwestern Monthly, July, 1897, page 24.

hearing, or from smoking. Some measures are below the average, but these we calculate to change in a year's work in the gymnasium."

Dr. E. M. Hartwell (1) of Boston says: "General defects, i. e., deformities, arrested development—stunting—have not been comprehensively studied as regards the student class, so far as I know. As yet, we scarcely know how heavy, tall, strong or enduring the normal boy or girl should be, and much less what the proportion is of defectives and delinquents, as regards physique, in our schools and colleges."

Dr. Seaver of Yale (2) reports about 4 per cent. of men entering college with hernia, about 6 per cent. have lateral curvature, and of these about 60 per cent. have lateral tip of the pelvis of at least 10 mm.

Physical education is receiving much attention throughout the United States. It is deemed essential to a well rounded education. In all the large cities some attention is paid to physical exercise in the grades. In the high schools regular exercises under the direction of a special instructor are given. Colleges have gymnasia, baths, and so forth, and instruction is given by a specialist in that line. Some of these institutions have medical examiners to determine the state of health of the pupils and regulate the exercises to be given them according to their physical condition.

In 1885 Amherst College instituted a compulsory physical training course, and from that time on there was less absence from study on account of sickness than had been previous to making the course compulsory. What was done for eighty men through physical training, along with their studies, is shown in the following percentages of increase in the measurements during the four years' college course (3):

	Per Cent Gain.
In bone structure	1.31
In muscular size	4.47
In vital organs	4.51
In bodily weight	7.42
In muscular power	24.90

The following statistics are taken from a report of 1895 of the department of physical education in the University of Wisconsin. The students were permitted to work in the gymnasium as they chose, the course not being compulsory. Towards the end of the college year, it being the second physical examination, the pupils were asked questions concerning the results of their physical exercise in the gymnasium. Seventy-five of these cards containing the answers were selected at random, and showed the following results:

The lowest average number of hours spent in the gymnasium was two per week, the greatest twelve. In answer to the question regarding improvement in health, five men answered "No," twelve stated that they ob-

(1) Northwestern Monthly, July, 1897, page 24.
(2) Northwestern Monthly, July, 1897, page 25.
(3) Dr. Denison, "Advantages of Physical Education as a Prevention of Disease," American Academy of Medicine, October, 1898, Vol. 3, p. 524.

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served no change, while fifty-eight testified as to improved state of health and strength as a result of the season's work, sixty-five testified that they could study much better, twenty-two said that they could spend one hour in the gymnasium and do as much studying in the remaining three hours as if they had spent all four hours at their books.

Abundant evidence can be produced to prove beyond a doubt that physical exercise is not only helpful but essential to the greater number of students. Conceding the importance of physical exercise, it is more evident that medical inspection should be instituted.

The system of uniform education has been so frequently denounced for the reason that it does not take into account the inherent abilities of different individuals. George Sand characterizes "the enforcing of common studies after a general fashion upon all children alike as the blackest crime of the intellectual world." But what should be said in denunciation of a system of enforced physical education on all alike, regardless of constitutional differences? The least harm would be done by doing as is done in the grades with the course of intellectual studies—strike an average of the class—thereby giving too much for the weak and too little for the strong. Such a system of physical instruction would be ridiculous, even more so than the intellectual, for there is more opportunity for individual and independent work in physical exercise.

A thorough physical examination should be made by a skilled physician, that the student's general health might be ascertained, his weak parts found out, and corrective exercise prescribed. Measurements should be taken from all parts of the body and recorded, and strength tests should be given. The heart, lungs and various internal organs should be examined and all evidences of disease and physical imperfections should be taken into account in prescribing exercise.

Many of the leading colleges are requiring a rigid physical examination on admission, and subsequent examinations during the course. For instance, in the Teachers' College of Columbia University, New York, at the beginning of each year two physicians hold office hours at the college, and each student, new and old, of the Horace Mann School (which includes the high school, the grades and the kindergarten), and all the first and second year college students are examined by them. The third and fourth-year students and post graduates are admitted to the college upon presenting a physician's certificate to the effect that they are in good physical condition; but if they select a course in physical training they are required to be examined by the college physician. Exercise is prescribed for each pupil according to his limitations and possibilities.

The following is the examination blank to be filled out:

TEACHERS' COLLEGE.

Physical Examination.

Department..... Class.....
Full name .....
Home address .....

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City address ..... Birthplace..... Date of birth.....
General health of father.....
If dead, cause.....
General health of mother.....
If dead, cause.....
Sisters, number .....
General health .....
If dead, cause.....
Brothers, number .....
General health .....
If dead, cause.....
State if any disease among ancestors likely to become hereditary.....
Height .....
Sitting height .....
Weight, A .....
Weight, B .....
Girth, chest, A .....
Girth, chest, B .....
Girth, waist, A .....
Girth, waist, B .....
Hearing..... Age .....
Sight..... Desk height .....
General appearance..... Spine, normal .....
Lungs, capacity..... Kyphosis .....
Insp..... Lordosis .....
Palp..... Scoliosis .....
Perc..... Pulse .....
Ausc..... Resp. .....
Heart Insp..... Defecation.....
Palp..... Micturition .....
Perc. .....
Ausc. .....

1. Menstruation .....
2. Any accidents? .....
3. Have you ever had a hernia? .....
4. Do you sleep well?..... No. of hours.....
5. State any illness you have had.....
6. Is the pupil in condition for both heavy and light gymnastics?.....
7. Is the pupil in condition to play basket ball?.....

Examiner .....
Date .....

II.

DEFECTIVE EYE-SIGHT.

So far as I have been able to learn, Dr. Hermann Cohn was the first to make any extensive examination of the eye-sight of school children. He began in 1865 (1) to examine the children of thirty-three schools of his native city, Breslau, including its university. Out of 10,060 pupils of all grades he found that 1,004 were near-sighted, and only 28 per cent. of these had near-sighted parents. In the first half of the first school year .4 of 1 per cent. were near-sighted. At 8½ years of age there were 5 per cent., and at 17½ years there were 20 per cent. who were myopic. Thus it gradually increased through the seven biennial grades till 63.6 per cent. of those who had been in school fourteen years were near-sighted.

Dr. Cohn, in 1867, found myopia among the university students as follows:

Fifty-three per cent. of the Catholic theologues.

Fifty-five per cent. of the law students.

Fifty-six per cent. of the medical students.

Sixty-seven per cent. of the Evangelical theologues.

Sixty-eight per cent. of the students of philosophy.

In 1880 he examined the medical students of the university and found "that 52 per cent. of those who had not passed the 'examen physicum,' 64 per cent. of the candidates who had already stood the examination, were myopic."

In 1871 Dr. Cohn examined the pupils of the Friedrichs Gymnasium, at Breslau, and repeated the examination upon the same pupils three semesters after. Seventeen of the pupils who had normal sight at the first examination were short-sighted at the second, and more than half of those who were found near-sighted at the first examination were found to be more so at the second. From his examination Dr. Cohn deduced the following laws:

1. Short-sightedness hardly exists in the village schools; the number of cases increases steadily with the increasing demands which the schools make upon the eyes, and reaches the highest point in the gymnasia.

2. The number of short-sighted scholars rises regularly from the lowest to the highest classes in all institutions.

3. The average degree of myopia increases from class to class; that is, the short-sighted become more so.

These laws have been confirmed says Dr. Cohn, by "more than thirty accurate reports of competent oculists, giving the results of the most careful investigations among more than forty thousand scholars."

Dr. Cohn further says: "If we inquire into the bearing of nationality and the development of the affection, we find that in the gymnasia at Upsala 37 per cent., at St. Petersburg 31 per cent., at Dorpat 55 per cent., at Lyons 22 per cent., at Tiflis 37 per cent., at New York 27 per cent., at Boston 28 per cent. of the students are myopic. In the gymnasia at St. Petersburg 34 per cent. of the Russian and only 24 per cent. of the German scholars;

(1) "Eyes and School Books," Popular Science Monthly, Vol. 19, p. 54 ff.

at Tiflis 30 per. cent. of the Russians, 38 per cent. of the Armenians and 45 per cent. of the Georgians, were near-sighted. Of 529 teachers in Lucerne, 14 per cent. of the Latin Swiss and 24 per cent. of the German Swiss were affected. Loring and Derby observed in New York, in 1876, that 14 per cent. of the children of Irish, 20 per cent. of Americans and 24 per cent. of German parents were near-sighted. At the International Congress of Physicians, held in Paris in 1867, I confidently addressed every one who wore spectacles in German, and was sure to receive an answer. The statements of all the authorities establish, however, that everywhere, and in all institutions, the number of myopes increases from class to class and becomes really formidable in the secunda prima of the gymnasia and real schools, and the corresponding classes of other schools. It ranges at between 35 and 60 per cent. of the whole number of scholars; but the proportion has been found to exceed 60 per cent. in the prima of several German gymnasia, and to rise to 80 per cent. at Erlangen and 100 per cent. at Heidelberg. Taking the average of the results of the examinations in twenty-five German and Swiss gymnasia, with 9,096 scholars, the percentage of short-sighted pupils rose from the sexta to the prima as follows: 22 per cent., 27 per cent., 33 per cent., 46 per cent., 52 per cent., 53 per cent." (1.)

The eyes of the Munich school children were investigated by Dr. Seggel (2). According to the Munich "Med. Wochenschr," he found in six public schools normal acuteness of vision in 60.7 per cent. of the boys and 54.3 per cent. of the girls. As far as refraction is concerned, he reports: Emmetropia, 64 per cent.; hypermetropia, 22.4 per cent.; myopia, 3.6 per cent.; astigmatism, 7.8 per cent.; other anomalies of the eyes, 2.1 per cent. In the middle schools the percentage of short-sightedness was as follows:

In the I class, fifth school year, 16.5 per cent.

In the II class, sixth school year, 24.5 per cent.

In the III class, seventh school year, 29.0 per cent.

In the IV class, eighth school year, 35.2 per cent.

In the V class, ninth school year, 40.6 per cent.

In the VI class, tenth school year, 46.4 per cent.

In the VII class, eleventh school year, 52.1 per cent.

In the VIII class, twelfth school year, 54.0 per cent.

Dr. Agnew (3) of New York, assisted by others, collected statistics as follows: "New York College, 549 students; introductory class, near-sighted. 29 per cent.; freshman, 40 per cent.; sophomore, 35 per cent.; junior, 53 per cent.; senior, 37 per cent. Brooklyn Polytechnic, 300 students: academic department, 10 per cent.; collegiate, 28 per cent. Cincinnati, 630 students: district schools, 10 per cent.; intermediate, 14 per cent.; normal high, 16 per cent."

In 1877 Dr. Lucien Howe made an examination of 1,003 scholars of the public schools of Buffalo. He found 20 per cent. of these to be near-sighted and 12 per cent. to be over-sighted. No case of near-sight was found

(1) "Eyes and School Books," Popular Science Monthly, Vol. 19, page 56.
(2) Zeitschrift für Schulgesundheitspflege, 1894, page 284.
(3) "Effects of Study and Eyesight," Popular Science Monthly, Vol. 12, p. 74 ff.

among children 6 years and under. At 7 years, 5 per cent. were near-sighted; at 11, 11 per cent.; at 13, 19 per cent.; at 18, 26 per cent.; at 21 and over, 43 per cent.

Dr. Risley (1) of Philadelphia says: "Many a boy who gets on indifferently at school, gaining a reputation for dullness or indolence, is prevented from going forward by his imperfect vision—a condition of which he may himself be ignorant. How is the child to know but that the blurring page, the watery eyes, the aching head, which follow any protracted use of the eyes, are not the common lot of mankind? This has always been his experience; why should it not be of his fellows also?"

Risley observes that in 2,422 children examined by himself in Philadelphia, 1,084 were found to have less than the normal acuity of vision, and that 1,099 had more or less trouble arising from the use of their eyes at books. The images are imperfectly made on the retina. The pupil strains to correct this defect and the strain distorts the ball and causes astigmatism, hypermetropia and myopia. The course should be somewhat elastic to enable those who are capable of doing a part but not all to do what they can.

West (2), on testing the school children of Worcester, Mass., in 1891, "found that out of 793 boys, 308, or 38.84 per cent., and out of 602 girls, 313, or 52 per cent., were short-sighted."

Table showing the percentage of defective sight by grades in Worcester.

Grade	I.	II.	III.	IV.	V.
Boys	35	52.7	52.7	38	41.6
Girls	31	67	67	48	51

From the fifth grade it declines steadily to the ninth, where it is 18 per cent. for the boys and 24 per cent. for the girls. The pupils were also classed "with respect to the amount of weakness of sight found in each sex, and finally with respect to the amount of weakness displayed by each of the eyes. Among the boys 46.5 per cent. were between .62 and .85 of the normal strength, 24.2 per cent. were between .50 and .62 of the normal, while 30.25 per cent. were below this.

Among the girls the percentages were 47.8 per cent., 24.25 per cent., and 28 per cent., respectively. Among the boys both eyes were defective in 53.77 per cent., in the right eye in 19.6 per cent., and the left eye in 26.63 per cent. of cases. For the girls the figures were 56.58 per cent. for both eyes, 20.55 per cent. for the right eye, and 22.86 per cent. for the left eye."

In 1876 Dr. Loring, Jr., and Dr. Derby (3) of New York examined 200 pupils of the Twelfth Street public school and the Normal school on Sixty-sixth street, New York. This report confirmed the report of others that myopia was found to affect a small percentage the first year and gradually increased yearly thereafter to the end of school life.

(1) "Defective Vision in School Children," Ed. Review, April, 1892, Vol. III, page 348 ff.
(2) "Eye Tests on Children," American Journal of Psychology, Vol. IV, pages 595-6.
(3) McLean, "Effects of Study on the Eyesight," Popular Science Monthly, Vol. 22, page 74.

In the fall of 1875 Dr. Haskel Derby (1) of Boston began a series of examinations at Amherst College with a purpose of noting the progress of myopia in the same class and the same individuals. He found 27 per cent. of the freshman class and 28 per cent. of the sophomore class to be near-sighted. His examination of the same students a year later showed a progress of the disease in one-half of the number previously found to be myopic. In 1877 he examined the eyes of 122 volunteers from the freshman class of Harvard College and found 29½ per cent. to be myopic.

COMPARATIVE CLASSES AS TO MYOPIA.

Dr. Cohn examined the eyes of many peasant children "living in a state of comparative simplicity and having little or no occasion to tax or strain the sight," and found that scarcely 2 per cent. were near-sighted.

Examinations of the children of factory operatives or artisans of England show a very low percentage of myopia.

Dr. Howe says: "Of 213 cases of eye diseases seen during the last year among the paupers of Buffalo, the record shows only 3½ per cent. to have been near-sighted."

Donders noticed the difference between his private patients and his hospital patients. His private patients representing the well-to-do class had a higher percentage of near-sight than the hospital patients who represented the poorer class of people. Oversight was distributed nearly equally between the two classes.

Dr. Peter A. Callan examined 457 colored school children, aged from 5 to 19 years, in New York, and found but 26 per cent. of near-sight among them. This seems to show that there is a hereditary tendency to myopia among those who have for generations been readers of books. Conclusions from these investigations, covering about 2,600 pupils, are:

1. That, as a rule, near-sight originates in school life.
2. That a large per cent. of the scholars are thus afflicted, the percentage progressing with the stage of advancement in study.
3. That near-sight is progressive in degree, according to the length of school experience.

Dr. Howe found that "in schools where the hygienic conditions relating to the position of the pupils and the amount of light are disregarded, the proportion of near-sighted pupils grows larger; and, conversely, where these relations are observed, the number diminishes."

As early as February, 1877, Dr. Loring advocated the examination of school children when they entered school and at frequent intervals afterward. By such an examination the position of a pupil's seat to the blackboard and light, and whether glasses should be recommended, would be determined.

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(1) McLean, Popular Science Monthly, Vol. 22, page 74 ff. (Authority for all statements on this page.)

Dr. D. N. Alcorn (1) of Stevens Point, Wis., examined the eyes of over 340 students in the Normal school and pupils in the model department.

He examined each eye separately, and his report shows some affection of sight, often very slight, in almost every pupil, though about 50 per cent. of them had normal vision, notwithstanding the defect, that is they could read letters 13 millimeters square at 20 feet. Classifying the pupils examined according to the department to which they belonged, showed the greatest defectiveness in the normal department, less in the grammar department, and least in the intermediate and primary. His report also shows that the extent of affection is greater in the older pupils, there being few serious defects among the youngest pupils.

The effect of sight on the general health seems to be marked. "Jessup reiterates the well known fact that persistent and recurring headaches in young persons and in those near the presbyopic age are in many cases due to an error of refraction, weak accommodation and anomalies of the extrinsic muscles. Mittendorf reports 4,000 cases of headaches that were relieved by the correction of optical defects. Coover details fifteen cases of reflex irritation following eye strain. Among the prominent symptoms, all relieved by full correction, are attacks of convulsions resembling epilepsy, caused by the continued use of the eye at the near point, headaches, vertigo, nausea, constant pains over the brows and occiput, restlessness, loss of appetite, faintness, insomnia, palpitation of the heart, chorea, stammering, cough without expectoration, irritation, thickness of speech and numbness of the hand and tongue, mental confusion, backaches and dyspepsia" (2.)

A system of inspecting the eyes of school children was instituted in Minneapolis in 1896 (3). A somewhat detailed description of the plan is here given as an example of how it may be successfully accomplished without being a financial burden to the district. The principals are to test the eyes of the children. An oculist is to be employed by the board of education, whose duty it is to lecture to the principals upon the elementary facts in ocular anatomy, physiology and hygiene, and upon the uses and application of the test types, etc. He is also to illustrate the method by practical demonstrations. The principals are each provided with a Snellen test card and printed instructions. The cost need not exceed $75 for a city of 200,000 people.

On the statistical blanks used in Minneapolis schools the following instructions for eye examination are printed:

"The examination should be made privately and singly, in a room apart from the general school session.

"Place a card of Snellen's Test Types on the wall in good light; do not allow the face of the card to be covered by glass.

"The line marked XX (20) should be seen at twenty feet, therefore place the pupil twenty feet from the card.

(1) Swift, "Eye Defects in Students and Children," Ped. Sem., Vol. 5, p. 202.
(2) "The American Year Book of Medicine and Surgery," 1897, page 893.
(3) "Defective Eyesight in American School Children," Review of Reviews, Vol. 15, June, 1897, page 694 ff.

"Each eye should be examined separately.

"Hold a card over one eye while the other is being examined. Do not press upon the covered eye, as the pressure might induce an incorrect examination.

"Have the pupil begin at the top of the test card and read aloud down as far as he can, first with one eye and then with the other.

"If the pupil can read XX (20) test type with each eye and does not, upon inquiry, complain of tired and painful eyes or headache, his vision may be considered satisfactory; but if he cannot read XX (20) test type with both eyes, or complains of tired and painful eyes or headache, a card of information should be sent to the parent or guardian.

"Please examine your entire school by this method, but only such pupils as are thought necessary to send to an oculist need tabulation in this blank.

"May 1st of each year please complete this report and send it to Dr. C. M. Jordan, superintendent of schools, and a duplicate to Dr. Frank Allport.

"This will afford you opportunity to examine your pupils, to note if they follow your suggestion with regard to consulting an oculist, and, if so, to observe the effect upon the pupil's conduct, health, application to study, etc., etc., which you will please carefully, but briefly, note in the proper place in this sheet."

The blank has columns headed as follows: "Name," "Sex," "Age," "State number of last line seen by pupil with right eye," "Last line seen with left eye," "Do the eyes and head grow weary and painful after study?" "Did pupil consult an oculist and follow advice?" "Briefly describe the results of treatment."

The following warning is sent by the principal to the parents when necessary:

"Dear Sir:

"Your child's eyes have been examined by me this day. I believe it advisable to consult a physician of recognized standing. Some eye doctor recommended, and if you feel unable to consult one at his office, a dispensary will do the work free of charge."

The report (1) of the first year's examination shows that 25,696 children were tested, of whom 8,166, or 32 per cent., were deemed defective. Among these 6,451 eyes were found possessing a vision of 20-30, or a little worse than normal; 2,257 eyes had a vision of 20-40, 1,214 a vision of 20-50, 1,130 a vision of 20-70, 745 a vision of 20-100, 447 a vision of 20-200, and forty-three eyes were practically blind; 4,472 children could not use their eyes to a reasonable extent without eye-tire, headache, etc. The percentages of defectiveness in the different schools ranged from 11 to 67 per cent., the higher percentages being found in the poorly lighted and unsanitary buildings.

Brundenell-Carter (2), in London, has reported to the educational council concerning the eyes of 8,135 school children in that city. He found that only

(1) Allport, "Tests for Defective Vision in Schools," Ed. Review, Vol. 14, September, 1897, page 156.
(2) Zeitschrift für Schulgesundheitspflege, 1896, page 609.

39.15 per cent. possessed normal vision. The most common failing was light hypermetropia. Myopia did not often occur, and both in frequency and degree was less among boys than among girls.

Dr. Crichton Browne (1) examined 6,580 children in the London schools as to short-sightedness and found 367, or 5.6 per cent. afflicted with the malady. He found 2.5 per cent. to be short-sighted in the first standard, which increased through the six standards as follows: 3.6 per cent., 5.8 per cent., 8.5 per cent., 8.4 per cent., 9.2 per cent. He examined them also as to squints, and found 2.5 per cent. with that affection.

The General Assembly of Connecticut for 1899 passed the following law:

"Section 1. The state board of education shall prepare, or cause to be prepared, suitable test cards and blanks to be used in testing the eyesight of the pupils in the public schools, and shall furnish the same, together with all necessary instructions for their use, free of expense, to every school in the state.

"Sec. 2. The superintendent, principal or teacher in every school, some time during the fall term in each year, shall test the eyesight of all pupils under his charge, according to the instructions furnished, as above provided, and shall notify in writing the parent or guardian of every pupil who shall be found to have any defect of vision or disease of the eyes with a brief statement of such defect or disease, and shall make written report of all such cases to the state board of education."

In accordance with the provisions of this act, the state board employed S. B. St. John, M. D., of Hartford, to prepare instructions for intelligently making the tests required by law, and the form of reports to parents and the state board of education. These instructions, accompanied with complete charts, were sent to the various districts in the state. The results have not been tabulated.

In 1899 the board of education of Colorado Springs, Colo. (2), instituted a system of inspecting the sight and hearing of school children. A specialist was employed to instruct the principals in the method of making the tests, and the work was performed by them. The tests were made only for ability to read the type at proper distances. No tests were made for astigmatism, and so the number of defective eyes is much greater than the figures show. Two thousand four hundred and one pupils were tested, and 655, or 23 per cent., were found to be defective in one or both eyes.

Of this number of children with defective eyes, 334 had eyes of unequal strength. Many of these varied greatly, thus causing much strain on the eyes to get along at all. A notice is sent by the teacher to the parents, stating that an oculist should be consulted.

The ear tests reported on 1,293 cases showed 160, or about 12 per cent., defective in hearing. Many simply had hardened wax in the ear.

(1) Report on Elementary Schools by Dr. Browne, page 31.
(2) From notes of Dr. E. G. Lancaster.

UNIVERSITY OF CALIFORNIA

In 1899 a system of inspecting the eyes of school children was instituted in the Cleveland public schools (1). The work of inspection is being done by the teachers with the following results:

During 1900 correct reports (above first grade), included 30,045 cases examined, of which 6,221, or 20.7 per cent., were reported as having defects. During 1901 correct reports (above first grade) included 32,939 cases, of which 6,169, or 18.7 per cent., were reported as having defects. In 1901 only new pupils to the Cleveland schools and those whose eyes were reported as defective were examined. Of the 6,221 cases found to have defective vision in 1899 and 1900, 938 were reported as wearing glasses at the beginning of the school year, and 1,634 were reported as wearing glasses by February 15 (date of report). Thirty-nine thousand and forty-three cases examined in 1900 and 1901 give the following per cents. for the respective grades: Grade 1, 11.2; 2, 16.3; 3, 18.6; 4, 18.5; 5, 19.4; 6, 20.4; 7, 18.9; 8, 20.4.

In the spring of 1900, under the direction of an oculist, the teachers of Milwaukee (2) examined the eyes of 19,618 school children. Of these 5,055 (25.75 per cent.) were found to have defective vision.

The report of the Department of Child-Study and Pedagogic Investigation of Chicago for 1900 (3) contains the summary of the results of testing the eyes of 4,765 pupils—2,030 boys, 2,735 girls. They were tested in the usual manner with the ordinary Snellen's type. Thirty-five per cent. of all the pupils tested were found defective—37 per cent. of the girls and 32 per cent. of the boys. The per cent. rapidly increases in the first three years of school life, suggesting that the school work of that period is hard on the eyes of the pupils. The lowest per cent. of defectiveness is found between the ages of 13 and 14.

In comparing sight and school standing it is found that there is a greater percentage of defectiveness among the pupils below grade than among the pupils at or above grade, except pupils at the age of 8 and 9, when the reverse is true, and a still higher percentage of defectiveness among the John Worthy pupils.

Systematic eye tests have also been made by the teachers in Denver, Los Angeles and Pawtucket (sight and hearing).

III.

DEFECTIVE HEARING.

Defective hearing is doubtless the cause of much apparent inattention and stupidity on the part of pupils. Often, very often, no one knows that there is any defect, not even the pupil himself is aware of it, until a test is made. It is perfectly natural for the pupil to think that he hears as well as others, for he has had no comparisons with normal children to point

(1) Annual Report of the Board of Education, Cleveland, 1901.
(2) Annual Report Board of School Directors, Milwaukee, 1900.
(3) Report of the Department of Child-Study and Pedagogic Investigation. Reprint from the 46th Annual Report of the Board of Education of Chicago, 1900.

out his defect. His lack of ready response is laid up against him as stupidity, and even sometimes as perverseness, when it is due to his not hearing distinctly what is told him. The parent or teacher thinks his hearing not at fault because at times he probably hears much better than at others, which is true with most cases of bad hearing. Also, one ear may be defective while the other is not; and when the good ear is turned to the speaker perfect hearing is experienced and prompt response is had, whilst when the defective ear is turned his lack of ready response is attributed to inattention, disobedience, or even stupidity.

The following are some of the tests and their results that have been made on school children:

Dr. Sexton (1) examined 570 children in the schools of New York City, and 76 were found defective in one or both ears. Of all these 76 pupils only one was known by the teacher to be defective, and only 10 knew themselves to be deficient in this sense.

At Terre Haute, Ind., Dr. J. P. Worrell examined 491 school children from 6 to 15 years of age with the following results: Seventy-two having both ears impaired, 53 having one ear impaired, making a total of 125 with impaired hearing. But three of these 125 were known by the teacher to be hard of hearing. The ages of those with a high degree of impairment of hearing were compared with the average ages of their respective grades, and it was found that those with bad hearing were older than the average of their grade, and generally larger.

Dr. Barr examined 600 school children of Glasgow, Scotland. Their ages ranged from 7 to 14, and were an equal number of boys and girls. He found 166 to be defective in hearing. After his tests were made, Barr asked the teachers to select 70 bright pupils and 70 backward pupils. He examined these and found 14 of the bright and 28 of the dull ones to be defective in hearing, thus confirming the supposition that the dull ones in our schools are the defective ones.

Moure examined at different times, about 1881 and 1883, 3,588 school children in Bordeaux, and found 616, or more than 17 per cent., to be defective in hearing. He claimed that at least 500 of the 616 children could be cured of their deafness if properly treated, but if left to themselves to adult age they would all be more or less deaf. These children were of both sexes and from 5 to 14 years of age.

Gelle found from 20 to 25 per cent. of all the children in an orphan asylum, from 7 to 14 years of age, defective in hearing. The most of these cases were pointed out by their teachers as dull, lazy and absent-minded. He also examined the hearing of pupils in schools of the first order in Paris. He selected those who were considered dull and bad and frequently needing punishment. A very large per cent. of these were found to be defective to a greater or less degree in hearing.

"Among twenty of the foremost pupils in four classes in a school there were but six who heard the watch at less than 50 centimeters, whereas

(1) Chrisman, "Hearing of Children," Ped. Sem., Vol. 2, pp. 403, 404, 405. (Authority for all statements on this page.)

among twenty of the lowest pupils in these same classes there was not a one that heard the watch at more than 50 centimeters. Among twenty foremost pupils in another school, three only heard below 50 centimeters, but twenty of the lowest pupils of the same school had seventeen among them who heard only at 50 centimeters or less."

A child who imperfectly hears is uncertain, hesitating and doubtful, as is shown by the inaccuracy of the work performed. One may not hear at all at a certain distance and hear perfectly at a shorter range. A girl who did not hear at all at 7 m., heard inaccurately at 5 m., but heard quite correctly at 4 m.

The results of Gelle's investigation in general show that about 25 per cent. of all the pupils have defective hearing; that there are fewer defectives among the bright pupils in a class than among the dull ones, and that among those whose range of hearing does not reach the limit of those with normal hearing, the advancement of the various pupils is generally in proportion to the limit of the range of hearing; or, in other words, the greater the impairment of hearing, the duller the pupil.

Weil (1) examined the hearing of 5,095 children, 3,228 boys and 2,677 girls, of Stuttgart. These children were from schools ranging from the elementary schools to the college, and therefore represented all classes of society. Great pains were taken to insure accuracy. He found about 30 per cent. who could not hear correctly at the normal range, the degree of deafness varying greatly in different pupils.

Weil concluded that the results of his investigations show better hearing in the schools attended by the better class than those frequented by the poorer class, and that younger children hear better than older ones. Weil firmly believes that the pupils hard of hearing are misjudged and considered inattentive. He believes that many of the children whom he examined could be entirely relieved in a few minutes.

Bezold (2) examined 1,918 children of the schools of Munich; 629 of these were almuni of the Ludwigs gymnasium, and give the following results: Twenty-five and eight-tenths per cent. possessed one-third or less of the normal hearing distance. Fourteen and five-tenths per cent. of the whole perceived whispered speech, heard by the normal ear at 20-25 m., only at 8-4 m., and 11.3 per cent. of the whole heard the whisper only between 4-0 m.

Reichard (3) of Russia, in 1878, published a paper on defective hearing. He had examined 1,055 school children and found more than 22 per cent. of them with less than the normal acuteness in hearing. Reichard observed that hearing was much better among the Slavonic race than among the Germanic. He thought the difference was due, not to race, but to the superior care and culture of the skin among the Slavs, who make greater use of the bath tub than the Germans do.

The difference was shown in the comparison of the children from two schools. The one school was situated in the suburbs. "These children

(1) Chrisman, "Hearing of Children," Ped. Sem., Vol. 2, page 409.
(2) Ib.
(3) Ib.

showed by their lean, flabby appearance, paleness of skin, often dull expression of countenance, slovenly dress, uncleanliness of hands and face, disorderliness of their hair and a disagreeable smell which clung to them that they were cellar dwellers." Over 40 per cent. of these were found to be deficient in their acuteness of hearing. The other school, situated in more healthful surroundings and attended by pupils from better homes, showed the highest degree of accuracy in hearing.

Lunin (1) examined the ears of 281 students of a female school in St. Petersburg in respect to sharpness of hearing. Their ages were from 8 to 20 years. He found the percentage of defective hearing to be 19.5.

In reference to the influence of bad hearing on the mental development and progress of the pupils so affected, Lunin gives the following data: "Of 226 students who heard whispering with both ears at 16 meters or more (being normal ears), 119 had a record for good work, 84 satisfactory and 23 bad. Of 43 hearing in one or both ears from 16 to 8 meters, 11 had a good record, 20 fair and 12 bad. Of 12 hearing in one or both ears from 8 to 0 meters, 1 had a good record, 5 fair and 6 very bad. Thus is shown that the more deficient the hearing the poorer the pupil is in his work. Also deficiency of hearing has great influence upon the character of the pupil, often causing him to become obstinate and ill disposed. Even if he tries to follow the instructions of the teacher, his hearing prevents. These hard-hearing ones are generally considered lazy, inattentive and dull by their teachers."

Zhermunski (2) received permission from the commissioner of education of Russia to investigate the condition of hearing among the school children of St. Petersburg. He examined 2,221 children, 1,318 boys and 903 girls, from 7 to 11 years of age, and in fifty different schools 388 pupils—221 boys and 167 girls—or 17.42 per cent. were found to have diseased organs. He thinks that over 80 per cent. of these could be completely healed by proper treatment.

He expresses the effect of hardness of hearing on the mental standing of the pupil by the ratio of satisfactory to unsatisfactory as follows:

"In pupils hearing the whisper in both ears from 24 to 12 m., the ratio of the satisfactory to the unsatisfactory is 4.19 to 1; those hearing from 12 to 8 m., the ratio is 2.6 to 1; from 8 to 0 m. is 1.7 to 1."

Schmiegelow (3) examined 581 school children of Copenhagen of both sexes, in age from 8 to 14. According to his reckoning of the proper range of normal hearing, more than 50 per cent. were either in the class of "bad hearing" or "defective hearing." After making the tests he asked the teachers to select those pupils who were "poorly gifted." They designated 79 pupils whom they considered backward. "Of these 79 children, 15 had a reach of hearing (whispering) of below 2 m., 36 from 2 to 4 m., and 28 only exceeded 4 m." Thus 51, nearly 65 per cent. of the 79, had defective hearing. His investigations showed that the worse the hearing the more "poorly gifted" they were.

(1) Chrisman, "Hearing of Children," Ped. Sem., Vol. 2, page 415.
(2) Chrisman, Ibid, pp. 420, 423.
(3) Ibid, pp. 420, 423.

Superintendent Seaver of the Boston schools, in a letter to the writer on November 10, 1899, said: "I agree with you in thinking that the eye-sight and hearing of children should be carefully investigated. Instances that come within my own observation prove that dullness of brain is imputed to children when it is only defective vision or defective hearing. I have no data collected bearing on this phase of the subject. I can only say that many cases have been discovered and remedied by proper treatment, given either by the family physician or at the hospital."

The Department of Child-Study and Pedagogic Investigation of Chicago (1) tested the hearing of pupils by means of the audiometer, invented by Prof. C. E. Seashore of the Iowa State University. This is an electric apparatus, well adapted to school tests, and is reported as being the best means yet invented for making such tests. It is fully described by Prof. Seashore in Studies in Psychology, Vol. II., issued from that University.

The per cents. of defectiveness of 5,706 pupils thus tested are shown in the following table:

	Three or More Points Below Normal.	Four or More Points Below Normal.	Five or More Points Below Normal.
With one ear...	25.3 per cent.	16.8 per cent.	12.2 per cent.
With both ears.	12.3 per cent.	6.8 per cent.	3.2 per cent.

From this table it appears that there is a large number of pupils whose two ears differ in hearing power. These will be at a decided disadvantage if seated on the wrong side of the room.

The report further shows that the percentage of defectiveness rapidly increases for the first three years of school life and again decreases. There is very little difference between the sexes in the matter of hearing, and the pupils of the John Worthy school show no striking difference from the pupils of the other schools.

IV.

INFLUENCE OF SCHOOLS IN SPREADING CONTAGIOUS DISEASES.

It will hardly be contradicted that the school room is a most fruitful place for the spread of contagion. Simply being confined in the same room is of itself conducive to this end. Any defect in the ventilation or sanitation of the room renders it more so. Children are prone to handle each other's pencils, erasers, etc., and through touch actually convey to each other any germs of disease that one may possess. They are often in school during the inception and development of the disease before any one suspects that there is anything the matter. Often children are returned to school before they are free from contagion. And still others may have a light and overlooked attack of the contagious disease and not be sick enough to stay away from school.

(1) Report of the Department of Child-Study and Pedagogic Investigation. Reprint from the Forty-sixth Annual Report of the Board of Education of Chicago, 1900.

Statistics of all the cases of diphtheria and scarlet fever collected in the state of Michigan, extending over periods from 1877-81 and from 1887-91, have been averaged by months and a curve traced showing the relation of these diseases month by month. The month of August shows a marked increase of sickness from these diseases, and the following month of September shows a still greater increase. The increase in August is doubtless due to climatic conditions, but the additional increase in September is believed to be due to the opening of the schools.

The Boston board of health, in 1897, published a table showing the number of diphtheria cases reported each month in 19 years, and the number of scarlet fever cases reported each month for 20 years. The sum total for the two vacation months, July and August, of diphtheria was 3,638 cases, and of scarlet fever 2,497 cases. The greatest number for any two months, being the school months of November and December, was 7,972 of diphtheria and 5,531 of scarlet fever. The least number reported for any two school months, being in September and October, was 5,512 cases of diphtheria and 3,604 of scarlet fever. Thus there were reported in the months of July and August 1,874 fewer cases of diphtheria and 1,107 fewer cases of scarlet fever than in any two months when school was in session.

Dr. Berger (1), who has made some investigations as to the influence of the different seasons of the year upon contagious diseases, concludes from these investigations that diphtheria among school children, as well as among others, is most frequent in the winter months, rarest in the summer months—June and July showing the fewest cases and January and February showing the most. Scarlet fever is most common in the winter months, and from March to July having the fewest cases. Measles occur most frequently in the winter months, but typhoid fever is most frequent in August and rarest from November to February. But whilst the conditions of the weather influence the spread of these diseases, it has been shown that the school is an important factor in the spread of contagious diseases.

The German physician, Koeroesi (2), investigating this subject, found for the three months of vacation only 3,054 cases of measles, for the first three months of the school year, 11,865; for the second three months of school, 13,258, and for the third, 13,147. A still more striking proof that the school is a factor in spreading contagious diseases is found in the fact that the time for vacation was changed one year on account of cholera, when the number of cases correspondingly decreased during the vacation.

Murphy (3) of London made investigations in the years of 1892-93 and shows similar results, especially for scarlet fever and diphtheria for the ages from 3 to 13, there being comparatively few cases during the summer vacation.

Dr. Schaefer (4) compiled statistics in regard to contagious diseases from the reports of Schleswig-Holstein and Hamburg for measles, scarlet

(1) Zeit. f. Schul., 1898, No. 1, page 26.
(2) Ped. Sem., Vol. VII, April, 1900, page 82.
(3) Ib.
(4) Ib., page 83.

fever, diphtheria and whooping cough for some sixteen years. His curves for scarlet fever and diphtheria show a decided sinking for the months of the summer vacation. The curve for measles reached its highest point in June, gradually falling till it reached its lowest point in August. The curve for whooping cough rises to a marked degree in July and August.

Dr. Hodge of Clark University compiled statistics of contagious diseases from the reports of the city of Worcester for the years '93-'98. Each vacation shows a marked depression in the curve for each separate disease. This chart shows that the curve for measles has a marked rise every three years, resulting in an epidemic. This is due to the fact that a child having had the measles once is immuned from the disease, and another epidemic cannot occur until there are more children born and a considerable number of the population become susceptible.

V.

MEDICAL INSPECTION OF SCHOOL CHILDREN.

If it is of sufficient importance to care for the physical well being of students attending the colleges and universities, it may well be asked, Is it not of equal importance in the high schools and in the grades? So far but few cities have any system of medical inspection of school children, but those that have instituted a system, and the tests that have been made, furnish statistics which show conclusively its value.

HISTORICAL.

As regards the history of investigations on the subject, it may be said that Peter Frank, in his "System einer vollstandigen medizinischen Polizei" (1), made not only the external arrangements of the school, but also the instruction the object of a somewhat detailed examination.

Lorinser, in 1836, published "Zum Schutze der Gesundheit in den Schulen," which attracted more and more the attention of the physicians to the matter. Also investigations in school hygiene were commenced in Sweden, in consequence of which the school hour was lessened in the year 1832, after gymnastics had been introduced in 1828 as a preventive against mental over-exertion.

Poppenheim, in 1858, made the demand for sanitary supervision of schools, and others in Prussia followed, viz., Faek, Alois, Gruber, Forquahr, Hermann Cohn, Baginsky, Wasserfuhr and others.

In 1869, at a Natural Science Association held in Innsbruck, it was recommended that a physician should be a member of each school board in a community.

At the Natural Science Association in Breslau, in 1875, and in Graz, in 1876, it was evident that in the meanwhile the school men had taken a position in reference to the school physician question; likewise the governments of the individual states: Württenberg, 1870; Baden and Elsass, 1876, then Hessen, and still later Prussia, 1884.

(1) Zeitschrift für Schulgesundheitspflege, 1897, page 193 ff.

Hermann Cohn gave an extraordinary impetus to the movement in 1882, but probably made too heavy demands to be immediately practicable.

At the International Hygienic Congress, held at Vienna in 1887, Cohn and Wasserfuhr proposed some practical theses which might serve as a foundation to an introduction of medical inspection, which were adopted.

In Württenberg medical inspection was officially introduced in 1875. It had official connection with the board of health.

In Stuttgart and in Frankfurt a. M., the school physician is invited regularly to all sittings of the city school authorities and takes part in their discussions, although with only advisory power. Further regular monthly conferences of the chairmen of the school board, of the city council, and of the city physician were instituted in which questions pertaining to school hygiene were freely discussed.

In Leipzig since 1892, 15 school physicians are appointed for every 4,000 or 5,000 school children. These physicians work with such reserve and caution that the teaching body perceive only the fruit of their labors.

School physicians are appointed in Berne, Basel, Lausanne, Neuchatel and elsewhere in Switzerland. Also in Austria, Hungary, France, Belgium, Holland and England are school physicians; and in Edinburgh, a male and a female school physician are appointed. It is evident that Sweden is not behind in the movement since the first investigations in school hygiene were instituted there.

In Prussia a statute for the intermediate schools requires that a physician shall be appointed for each of these schools, whose duty is to inspect both the school and the scholars. Since 1887 the physicians have the right to vote on hygienic questions in the sessions of the school boards. In Moscow, in 1888, two school physicians were appointed for the female Gymnasien.

Dr. Mishima, in a letter to the publisher of the "Zeit. f. Schul," informs us that Japan since 1893 has had school physicians.

In Prussia according to the statement of Dr. Edel in the "Zeit. f. Schul," 1897, it is the duty of the physicians to investigate the schools in the towns where they reside and also other schools within the district of their practice. These investigations are to be reported to the school authorities. The physicians, however, are mostly only in the position to investigate the schools as buildings, whilst they come in contact with the school children only with reference to vaccination. These provisions have been of little avail; for often the physicians have no opportunity to examine the children, or nothing is said in their reports concerning the scholars, or the only remarks in reference to them are those bearing on infectious diseases. Only here and there is an individual physician's report concerning school investigations which gives anything in reference to the diseases of the scholars, as for instance, that of Dr. Langerhans and a few others. The statutes of 1884 require the physicians to report on contagious diseases of school children. According to an ordinance of the city of Breslau of 1887, physicians of good repute are to be called in for council for all new school arangements, including new buildings and repairs.

Provisions are made in the school administrations of the following cities in Prussia for children who are not gifted with ordinary intelligence and who are of a school age: (1)

Königsberg in Pr., Brandenburg, Charlottenburg, Guben, Stettin, Breslau, Görlitz, Magdeburg, Halberstadt, Halle a. S., Erfurt, Nordhausen, Altona, Hanover, Göttingen, Lüneburg, Dortmund, Kassel, Frankfurt a. M., Düsseldorf, Krefeld, Elberfeld, Essen, Köln and Aachen. With the exception of Brandenburg, Guben, Magdeburg and Halle a. S., the children are received into these schools after medical examination. The teachers keep a careful record of these children from one-half year to the other. The results were so favorable that a large number of the children were returned to the public schools. Others, on the contrary, were transferred to institutions for idiocy.

The Berlin school deputation according to the British Medical Journal (2) has determined that every child of the public schools who is not promoted after two years' stay in one class shall be examined by the school physician in reference to his mental capacity.

In Plauen i. v. the weak-minded children were medically inspected in 1893 and 1894. As an example of the results of this inspection, thirty weak-minded children examined in 1894 were found to have suffered as follows:

7 from an English disease.
3 from diphtheria.
3 from inflammation of the lungs.
5 from acute constitutional diseases.
5 from convulsions.
2 from nervous disorders.

In Austria also especial care is being taken of mentally weak children.

SWITZERLAND.

In Switzerland (3) each canton makes its own arrangements for medical inspection. In Basel the physician devotes most of his time to visiting the schools. He is to test the pupils' eyesight and hearing and to make suggestions as to their proper seating. He examines the conditions of school houses and surroundings and reports to the proper officials. He has power to exclude children on account of illness and sees that parents observe the regulations in regard to infectious diseases.

Teachers recommend to him pupils who they think ought to be placed in special classes for backward pupils, to receive free food, or to be sent on a vacation. He investigates these cases and does not always decide as the teacher recommends. For instance, one year, of 19 boys and 25 girls recommended by the teachers for the dullards' classes, he chose only 16 boys and 23 girls. He is consulted in all new arrangements that the health of the children may be cared for.

(1) Zeit. f. Schul., 1897, page 44.
(2) Zeit. f. Schul., 1897, pp. 231, 280.
(3) Zeit. f. Schul., 1892, page 273.

The general interest in the question is further shown by the fact that the Medical Society of the Canton of Zürich recently recommended that the new school law for the canton should contain the following paragraph: "Periodical investigations should be made by physicians of the health condition of the school children and the sanitary condition of the schools."

The society recommends:

First—That all the children on entering school should be examined in the course of the first school year.

Second—That the investigation should cover the following points: Height, weight, vision, hearing, mouth, teeth, nose, breathing and disturbances of speech, vaccination, general health conditions, physical and mental.

Third—The investigations should take place periodically, and should be at least at the beginning, in the middle, and at the close of the all-day schools, and extended to the secondary schools whenever possible.

Fourth—The physicians should examine the sanitary conditions of the school houses several times a year.

Fifth—Every child should have a health card attached to his diploma.

Sixth, Seventh and Eighth—Details in reference to reports.

Ninth—That the assignment of these investigations to the physicians is within the province of the school authorities.

Tenth—That the physicians should be paid for their work by the state.

GERMANY.

The plan of carrying on the work in the different cities of Germany varies. That of Wiesbaden has been recommended by the Cultus-minister for general adoption and is therefore given somewhat in detail.

From a circular (1) issued May 30, 1897, we learn that the duty of the school physicians is to have oversight of the health condition of the pupils allotted to them, and to co-operate in the medical inspection of the premises and equipment of the school in accordance with the regulations of the authorities in regard to this duty. In accordance with the special regulations it is his duty to investigate the physical condition and health of the pupils who newly enter the school, to determine whether they need permanent medical supervision, or special consultation in the school. (For example, dismissal from instruction in certain subjects, as gymnastics, singing, or limitations of their share of instruction, allotment of special seat on account of defects of eyesight or hearing). A health card is to be filled out for every child, and this is to be kept with him during his whole school period. If a child is in constant need of medical supervision his card is to be marked "medical control," and he is to be reported at each visit of the physician. The weighing and measuring is to be undertaken by the class teacher and record is to be made each half-year on the cards. In cases of lung diseases the chest measurements are to be made by the physician. He is to hold consultation in each school in the forenoon from 10 to 12 every fourteen days, or oftener in

(1) Burnham, Ped. Sem., Vol. VII, No. 1, April, 1900, page 75.

cases of contagious diseases, on a day previously appointed in consultation with the school director. If he wishes to visit the school on some other day than the one decided upon he must notify the director of his intention at least three days before.

The first hour of the consultation period should be devoted to visiting five class rooms during the instruction. Every class room, when possible, should be visited twice each half-year. At these visits all the children are to be subjected to an external inspection; and if, in special cases demanding immediate consideration, information is desired by the teacher, this information is to be given him. If individual pupils appear to need a more careful investigation, this is to be given afterwards in the physician's consultation room. At the same time these visits will serve for inspection of the school localities and their arrangements, and for the control of the ventilation, heating, physical position of the pupils, etc. The second hour of the consultation is to be devoted to any more careful investigation demanded. At this time in pressing cases, the children also from rooms not visited that day are to be presented to the physician, especially where there is suspicion of contagious disease. The class teacher is to be present at the time of the medical inspection. The whole general arrangement is under the school director. The school physician does not treat the cases needing attention. Such children are rather to be directed to their home physician, or to a physician for the poor, or to a special physician, or to some hospital. This may be done orally, but if the warning is not heeded, appropriate printed instructions may be filled out for them. All harsh expressions or the like are to be avoided.

At the request of the school director, the school physician shall investigate individual cases in their homes, to determine, in case the parents bring in other satisfactory certificates, whether absence from school is excusable.

The school physicians shall not have the right to give independent instructions to the school directors and teachers, to the janitors and other school servants. If they believe that the recommendations made by them in respect to the treatment of the children, or the hygiene of the premises, is not given sufficient consideration, then they shall present their complaints with reference to this through their representative in the school hygiene commission. In pressing cases they can also make statements before the city school inspector, or before the Royal Kreisphysikus.

It devolves upon the school physicians to give short lectures on the most important questions of school hygiene before the teachers' meeting.

Before May the 15th of each year the school physicians shall make a written report to the senior school physician, who in turn reports to the magistrate by the 1st of June. The following points are to be covered in the reports:

(1) Statistical tables of the results of the initial examinations.

(2) The number of consultation hours held, and the official visits to the class rooms.

(3) The number and kind of the more important cases of diseases which have been investigated in the consultation hours.

(4) Any special dispensations made (limitations of the hours of instruction of gymnastics excepted).

(5) The number of written communications sent to parents.

(6) The number of school children under special medical supervision or control.

(7) A summary of the notes in regard to the premises that have been entered in the hygiene book.

According to the last report (1) of the medical examination of Wiesbaden an examination of 1,300 children was made and only fifteen were exempted from this by the presentation of a certificate from a home physician. The result of this examination showed in the middle schools as regards general health, 44.9 per cent. good, 54.8 per cent. medium, 3 per cent. bad. In the people's schools, on the other hand, 34.4 per cent. good, 58.8 per cent. medium, 6.8 per cent. bad.

Among about 300 children in the middle schools less than 11 per cent. were found suffering from diseases, not reckoning defects of the teeth; and among about 970 children in the people's schools 51 per cent. In eight cases contagious diseases were detected, and the children immediately excluded from the school, three cases of scarlatina, one of measles, and four of whooping cough. Drastic measures were adopted in regard to pediculosis; compulsory cleaning at the city hospital in three cases, had a good effect; the number of cases of children suffering from parasites decreased from 194 in the previous year to 125. In the course of the school year in some one hundred cases written communications had been sent to the parents in regard to the diseases of their children, and in sixty-five cases, as a direct result, pupils had been supplied with spectacles, had received medical treatment, etc. In some eighty cases, special care in instruction, gymnastics, etc., had been arranged for at the advice of the physician. Further, thirty-six teachers from different schools had received a short course of instruction in regard to emergencies, etc.; and in common sittings of the school physicians with the hygiene commission a number of questions relating to questions of hygiene had been discussed. (2)

The report of the school physicians in Darmstadt for the year 1898-1899 gives the following statistics: "Among 5,502 children tested, the general health in 26.3 per cent. of the cases is reported as good; in 68.67 per cent. of the cases it is reported as fair, and only in 280 cases is the report bad, viz., in 5.08 per cent. of all; 2,308 cases of disease were observed, most frequently anaemia, about 10.5 per cent. of the girls and 2.5 per cent. of the boys; then scrofula, rickets, diseases of the bones, diseases of the mouth, nose and throat. About 80 per cent. of the children tested had bad teeth; parasites were found in about 200 cases. These children were placed under constant supervision and in 5.3 per cent. of the cases special care was required during instruction." (3)

(1) Burnham, Ped. Sem., Vol. VII, page 80, from Zeit. f. Schul. No. 11, pp. 637-650 and No. 12, pp. 728-733.
(2) Ped. Sem., Vol. VII, page 80.
(3) Ibid, p. 80.

LONDON.

Dr. Crichton Browne (1) investigated eleven elementary schools in London as to the health of the pupils. Of 6,580 pupils interrogated as to habitual headaches, 3,034, or 46.10 per cent., were reported as thus afflicted. The report shows 43 per cent. of the first standard, 46.5 of the second, 44.2 of the third, 46.8 of the fourth, 48.2 of the fifth, and 56.3 of the sixth, afflicted with habitual headaches. He contends that a majority of headaches are of a distinctly nervous character and proceed from functional disorder or organic change in some portion of the nervous system. He gives extended tables showing the localization of headaches, his effort being to prove that overpressure exists in the English schools.

He examined 4,300 pupils as to sleeplessness and reports 1,668, or 38.8 per cent. as thus afflicted. Among 527 pupil teachers, 340, or 64.5 per cent., were reported as habitually having headaches. Among 107 students in a training college, 60, or 56 per cent., had habitual headaches. Among 388 pupil teachers, 211, or 54.4 per cent., suffered with neuralgia within a period of six months.

For the purpose of comparison, Dr. Browne examined 355 children, 186 boys and 149 girls, of ages from 6 to 14, of five Scotch schools, situated in the agricultural district of Dumfriesshire, and found that only 23 complained of headaches, which gives a percentage of 6.5, against 46.1 for London.

Dr. Browne thinks that he was reasonably careful in his investigations and that the real number of headaches is even greater than the number reported.

Mr. J. G. Fitch, one of Her Majesty's chief inspectors of schools, says: "But the method of investigation adopted by Dr. Browne appeared, so far as I am able to form an opinion, to be neither judicious nor trustworthy. He stands before a class, say of sixty boys, and asks all who ever have headaches to hold up their hands. He proceeds to ask all who feel it at the back of their heads, at the top, in the forehead; all those who suffer from it in the morning, in the afternoon, in the evening, successively to hold up their hands. The boys are amused, and a little puzzled; they peep at one another; they look at the teacher to try to catch some indication of the way in which they are expected to act; they see the strange gentleman counting their hands and gravely recording the result in a note-book; and their hands go up or are kept down very much at random. After seeing this process repeated a great many times, I wish, with all deference, to express my conviction that it is an utterly unscientific mode of arriving at evidence, and that the results bear no true relation to the children's actual experience or knowledge." (2)

(1) Dr. Crichton Browne, "Report on Eng. Elem. Schools." Printed by order of House of Commons, 1884.
(2) Memorandum on Dr. Browne's report by Mr. J. G. Fitch, page 56.

DENMARK AND SWEDEN.

The first fundamental research into the physical and mental health of school children was instituted in Copenhagen by Dr. Hertel in 1881. The result of Dr. Hertel's work was so significant that a special commission was appointed to examine the conditions of health in all the schools in the kingdom. About the same time a grand commission was named in Sweden to examine into the conditions of school life.

The Danish Commission (1), (reported in 1883,) examined 17,595 boys and 11,646 girls in the higher schools and in the Volksschulen, ranging in age from 6 years to 19 years. The diseases reported were chronic, no record being made of the acute diseases. These were scrofula, anaemia, nervous complaints, headache, nose-bleed, chronic indigestion, chronic lung and heart complaints, curvature of the spine, rheumatism, etc. This commission found from 26 to 34 per cent. of all the boys ill with some disease or other, varying with the age, being highest at the ages of 10 and 18 years. The girls, from the ages of 7 to 18 years, showed an illness of from 25 to 50 per cent., being the greatest between the ages of 13 and 14 years. The Swedish commission examined about 15,000 boys and 3,000 girls, and found that among the boys varying at different ages, 28 to 40 per cent. were sick with chronic disorders. The girls between the ages of 7 and 18 years showed an illness of 25 to 64 per cent., being highest in the 13th year.

A member of the Swedish commission, Prof. Axel Key, speaks as follows (2):

"According to my examinations of 15,000 boys in the middle schools, more than one-third are ill or are afflicted with chronic maladies. Short-sightedness, which is demonstrably for the most part induced by over-taxing the eyes in school work, and well merits the name of schoool sickness, rises rapidly in height of prevalence from class to class. Thirteen and a half per cent. of the boys suffer from habitual headache, and nearly 13 per cent are pallid; and other diseases arise in the lower classes to decline and rise again in the upper classes. Diseases of the lungs are most frequent among organic disorders. Diseases of the heart and intestinal disorders show a considerable tendency to increase in the higher classes. As to the average of illness in the different classes, it appears that in Stockholm 17 per cent. of the children in the first class were ill at the end of the first year. In the second school year the illness curve rose to 37 per cent., and in the fourth class to 40 per cent. This remarkable increase of illness during the first school year is not casual, but it is exhibited in all the schools; and corresponding conditions were brought to light in the examinations of Danish pupils. A sickness ratio of 34.4 per cent. was found as early as in the lowest classes of the middle schools.

"The most healthy of all the years of youth is with boys of the 17th, which is also one of the two years of most active growth. The 18th, on

(1) Burk, "Growth of Children," Am. Jour. of Psych., Vol. 9, No. 3, April, 1898, page 288.

(2) "School Life in Relation to Growth and Health," Popular Science Mo., Vol. 38, pp. 107 ff. 1890-91.

the contrary, which follows immediately on the attainment of puberty, appears to be a very unhealthy period.

"Among the school girls, the future mothers of generations to come, investigation instituted in thirty-five schools, with 3,072 pupils, brought out a fearful amount of illness. Sixty-one per cent. of the whole, all belonging to the well-to-do classes, were ill or afflicted with serious chronic disorders. Thirty-six per cent. were suffering from chlorosis, and as many from habitual headache; at least 10 per cent. had had spinal disorders, etc."

PARIS. (1)

As regards the history of medical supervision of schools in Paris, it should be observed that the law of 1833 made it the duty of the school committees of the respective towns and cities of France to keep the school houses clean as a sanitary precaution, and a royal ordinance of 1837 especially charged the supervisors of the maternal schools (kindergartens) to watch over the health of the little ones. These two decrees referred to all the schools of France. Special decrees for Paris were issued in 1842 and 1843, ordering all the public schools to be visited by a physician, whose duty was to inspect the buildings and grounds, as well as the general health of the children. No appropriation, however, was made for this purpose, and the generosity of the medical fraternity had to be called upon to carry out this very commendable arrangement, and a number offered their services and acted gratuitously for many years.

In 1878 the system was reorganized, and 34,200 francs were voted by the council for paying the medical supervisors of the schools. The Seine department was divided into 114 districts for medical supervision, each containing some twenty or twenty-five school rooms. Of these districts 88 were within the city limits of Paris. The medical inspectors were selected only from graduates of well reputed schools of medicine, were to be nominated by the mayors of the respective wards (arrondissements), and appointed by the prefect of the department. Their annual salary was fixed at 600 francs, and the term of office three years. Their duty was to visit each school of their respective districts at least once in two weeks, and to inspect the "localities" (corridors, stairs, water-closets, etc.), of the schools, and remove children having any contagion. They might order the schools closed in times of epidemics. During the absence of the physician the principals, who had received instructions in regard to the symptoms of contagious diseases, watched over the health of the children.

Profiting by the experience of the first three years of this service, the city council appointed a commission to revise the regulations, which revision was reported and adopted in November, 1883, and went into effect January 1, 1884.

(1) "Medical Supervision of the Schools in Paris," Report of Commissioner of Education, 1897-98, page 1509, from Educational News, December, 1890.

These new regulations, which are still in force, contained the following changes or additions:

Each district for medical supervision is to contain from fifteen to twenty school rooms. The city is to be redistricted every three years by the prefect. The annual salary of a school physician is 800 francs. Every school physician must announce to the mayor his residence or office and the hours at which he may be found there.

This statement is posted in a conspicuous place in every school room. In addition to his semi-monthly visit to each school room he must also appear whenever the mayor or prefect may deem it wise to require a visit. He must examine each child at least once a month with reference to eyes, ears and teeth. If he notices any indication of disease, or if the general health of the child needs attention, this is noted on a certificate and sent to the parents of the child. If a child appears to be sick during the absence of the physician the teacher reports the case to the principal, who has at hand instructions from the supreme sanitary council, in which the symptoms of contagious and infectious diseases are stated. If he finds symptoms of any contagious or infectious disease, he sends the child home with a note, asking the parents to call at the office of the school physician during his office hours. A certificate of recovery, signed by a school physician, is required of every child who has been out of school on account of sickness.

Within twenty-four hours after each sanitary and medical inspection the physician is obliged to report to the mayor of the ward the sanitary condition of the school. The mayor is required to report to the prefect summaries of the various individual reports and propositions and suggestions which seem of special importance. Propositions not so pressing and of general importance are referred to special medical committees for deliberation and subsequent report.

The mayor reports every three months to the prefect of the department the sanitary and medical condition of his ward. Semi-annually he sends in a report containing suggestions for changes and improvements. In 1887 medical and sanitary inspection was made obligatory "for all schools, public and private" (1). The system of medical supervision of schools of Paris has become a model for other cities of France.

Dr. Herman T. Lukens (2) says (1899): "Dr. Mangenot has drafted a project of a new law requiring daily visits and individual examination with separate individual bulletins for each pupil. All the pupils are to be weighed and measured twice a year. These data are to furnish the basis for indicating to teachers, first, how to seat the pupils; second, which to relieve of home work or gymnastics; third, which need medical attention outside; fourth, which need preventive medication (i. e., supplement to home

(1) Mangenot, writing in 1896, says that the private schools in both Paris and the provinces have no medical inspection. (Ped. Sem., Vol. VII, page 72.)

(2) "Notes Abroad," page 9.

diet, e. g., cod liver oil, etc.); fifth, which pupils should join the 'colonies scolaires.'"

CHILDREN'S DISPENSARIES. (1)

As early as 1862 there were a few dispensaries in Paris where children of certain hospitals could receive treatment. These were supported by charitable societies, and could not always furnish all the treatment that was most desirable. In 1875 a public free dispensary for children was established in Havre by Dr. Giebert, assisted by private contributions. This has the distinction of being the first of its kind ever established. It had a remarkable success from the start, and soon was made a city institution.

The first children's dispensary in Paris was opened in 1883, in the first ward. In the first seven years of its existence there were conducted 60,000 consultations. The number the first year was 5,037. This was steadily increased to 19,000 in 1889. "The example set by the first arrondissement soon found imitators. To-day (1890) eight arrondissements have children's dispensaries, partly supported by private persons, partly by the city. The excellent influence these few institutions have exerted has awakened the desire of increasing their number and to provide every ward of the city with one; hence a credit of 100,000 francs was opened for that purpose in the city budget of 1890, and all indications point toward an early fulfillment of the desire mentioned above, namely, that the medical and sanitary inspection of the schools be supplemented by a great number of free dispensaries, in which children will find treatment needed in cases of sickness."

BOSTON. (2)

In 1890 the board of health of the city of Boston proposed to furnish daily medical inspection, with the view of discovering the earliest symptoms of infectious diseases among the children. On account of the lack of an appropriation of funds for that purpose the system was not inaugurated until November of 1894. The board of health divided the city into districts, giving about 1,400 pupils, and an average of four school houses to each district. One inspector, at a salary of $200 a year, was appointed for each district. Some of the best medical talent in the city are engaged in the work. Their duty is to visit each school daily, early in the morning, and to examine all children whom the teacher thinks ailing. The teachers report to the principal all pupils whom they think appear ill, the physician examines them, and if any one is found too ill to remain in school, from any cause, he is sent home for the observation and care of his parents and family physician. If the illness is contagious the child is ordered home and the case is reported to the board of health. It is also the duty of the inspector to visit the homes where contagious diseases exist, to see that

(1) United States Education Report, 1897-98, page 1511.
(2) Mass. State Board of Health Report, 1894, p. 819; 1895, p. 756; 1896, p. 870.

proper isolation of the patient is attended to. The child is not readmitted to school without permission of the inspector.

Superintendent Seaver, in his annual report for 1895, gives the following (1):

"The total number of children examined during the four months ending February 28, 1895, was 9,063, of whom 5,825 were found to be sick, and 3,238 were found to be not sick. The number found sick enough to be sent home was 1,033; of these 280 were suffering from contagious diseases, as follows: Dipththeria, 58; scarlet fever, 19; measles, 42; whooping cough, 17; mumps, 35; pediculosis, 47; scabies, 33; congenital syphilis, 7; chicken-pox, 22. These children were in their seats spreading contagious diseases amongst other children. The number of children who were saved from these diseases by the timely discovery and isolation of the sick children is, of course, beyond computation.

The other diseases discovered and for which necessity for treatment was pointed out were as follows: Abscess, 22; catarrh, 244; cellulitis, 12; chorea, 11; colds, with more or less bronchitis, 224; debility, 63; diseases of the ear, 35; diseases of the skin and scalp, 186; diseases of the throat and mouth, 3,489; epilepsy, 5; fracture of the collar bone, 1; headache, 171; indigestion, 42; malaria, 17; nausea, 50; Potts' disease, 3; swollen glands, 133; ulcers, 16; wounds, 21; miscellaneous diseases, 411; examined for vaccination, 117."

For the fourteen months from November 1, 1894, to December 31, 1895, 16,790 pupils were examined; 6,053 were not sick, 10,737 were found to be ill, and of these 2,041 were sick enough to be sent home. (2)

The following contagious diseases were found:

Diphtheria	77
Scarlet fever	28
Measles	116
Chicken pox	28
Mumps	47
Whooping cough	33
Pediculosis	69
Scabies	47
Congenital syphilis	8
Total	453

For the year 1896, twelve months, 8,964 pupils were examined; 1,156 were too ill to remain in school.

(1) Annual Report of Public Schools, Boston, page 77.
(2) H. D. Arnold, M. D., "Med. Insp. of Schools." Annals of Gynecology and Pediatry, January, 1898, Vol. XI. Report of Com. of Education, 1897-8, page 1491.

OF THE UNIVERSITY OF CALIFORNIA

Specific infectious diseases:	
Diphtheria	26
Scarlet fever	8
Measles	59
Chicken pox	35
Mumps	54
Whooping cough.	71
Syphilitic	5
Tuberculosis	3
Influenza	4
Erysipelas	1
Malaria	1
Total	267
Oral and respiratory diseases	3,934
Ear diseases	66
Eye diseases	382
Skin diseases	628
Miscellaneous diseases	3,687
Total	8,964

Dr. Durgin reports an epidemic of diphtheria as follows (1): "An epidemic of dipththeria occurred in a primary school in which there were forty pupils, fourteen of whom were attacked with diphtheria within a period of eighteen days, all from one room. Of the fourteen cases seven were discovered by the school inspector and three of these only by cultures. All suspicious cases were dismissed from school May 5, and recommended to the care of their family physicians. The next morning every pupil was examined and many cultures were taken. The class was then dismissed from Thursday to the following Monday, the room disinfected and cleaned. For ten days after their return the throat of every pupil was examined by the medical inspector when they first assembled in the morning, and no pupil who had been absent with any suspicious symptoms was allowed to return until it was proved by a negative culture that there could be no danger. As a result of these measures not a single case of diphtheria resulted beyond those known to have been infected at the time the epidemic was discovered. A similar experience with scarlet fever occurred in the service of the same school inspector within two weeks, in which eleven cases resulted from the presence in school of one pupil whose illness had been attributed to German measles."

Superintendent Edwin P. Seaver, under date of October 30, 1899, in a letter to the writer, states: "The system has been in operation for several years and has been found universally acceptable. There is no doubt

(1) "Medical Inspection of Schools," S. H. Durgin, M. D., Ch. Board of Health, Boston. Read at Annual Meeting of the Mass. Med. Society, June 9, 1897, page 7.

that it has protected the school from the ravages of epidemics and other diseases, such as scarlet fever, diphtheria, and recently, I may add, smallpox."

NEW YORK. (1)

In 1897 New York City instituted medical supervision by appointing 134 physicians to visit the schools. Later the number has been increased to 150. "Inspectors are requested to report at the schools to which they have been assigned from 8:50 to 9:30 a. m. every day that school sessions are held. They are carefully to examine each child that has been isolated by the teachers in charge of the schools, and cause to be excluded from school each one affected with or showing symptoms of any contagious or infectious disease, more especially the following: Measles, diphtheria, scarlet fever, croup, whooping cough, mumps, contagious eye diseases, parasitic diseases of the head or body, or chicken pox." (2)

The child excluded from school is furnished a card by the inspector stating the reason for the expulsion. Within twenty-four hours of the time the child is excluded from school one of the diagnosticians of the board is sent to the home of the child for further examination. If he confirms the first diagnosis the pupil is excluded until complete recovery is effected, when a certificate allowing him to return to school is issued.

The first day, March 29, 1897, gave the following results: (3)

140 children excluded.
14 cases diphtheria.
3 cases measles.
1 case scarlet fever.
35 cases contagious eye diseases.
3 cases mumps.
1 case croup.
8 cases chicken pox.
8 cases skin diseases.
67 cases parasitic diseases.

Cases of neglect of cleanliness were numerous.

The weekly report (4) of the chief inspector, Dr. Blauvelt, for the week ending April 10, 1897, shows that 7,398 children were examined and 364 excluded from school.

The number of diseases was as follows:

2 measles.
13 diphtheria.
1 scarlet fever.
3 croup.
4 whooping cough.
10 mumps.

(1) Boston Medical and Surgical Journal, March, 1897.
(2) Instructions for Med. Sch. Inspectors, New York, 1899, page 1.
(3) "Physical Training in New England Schools," W. Scott, Boston, page 4.
(4) New York Medical Record, April 22, 1897.

59 contagious eye diseases.
227 parasitic diseases.
15 chicken pox.
19 skin diseases.

Dr. Blauvelt's report (1) to the board of health for the week ending April 23, 1897, showed 4,599 examinations, of which number 243 were excluded, having the following diseases:

4 cases of measles.
4 cases of diphtheria.
1 case of scarlet fever.
2 cases of croup.
13 cases of mumps.
8 cases of chicken pox.
28 cases of contagious diseases.
160 cases of parasitic diseases of the head and body.
13 skin diseases.

CHICAGO. (2)

The board of health of Chicago, in 1895, instituted a system of inspection of schools, but from a lack of funds appropriated for the special purpose it was very inefficient. The city was divided into nine districts, one medical inspector being assigned to each, giving an average of more than twenty square miles for each inspector to cover. Notwithstanding this limited service, during four months 350 individual inspections of 233 public schools were made, with the result that 1,417 cases of diphtheria and 306 cases of scarlet fever were located. During the school year 1896-97, 1,181 visits were made and 4,023 cases of contagious diseases were located and taken charge of for preventing further spread of the same. The unsanitary conditions of sixty-three public schools were reported to the board of education, and unsanitary conditions remedied in fifty-three homes of patients.

On November 15, 1899 (3), the board of education decided to appoint fifty medical inspectors, at a salary of $50 a month, to serve through the school year while school was actually in session. These inspectors are attached to the department of compulsory education, and are assigned to duty under the direction of the commissioner of health.

The present plan was proposed by Dr. Christopher, a member of the board, and is somewhat modeled after the plan adopted in Boston and New York. An examination of applicants for the position of inspector is made, and those are selected who show the greatest fitness for the work by their knowledge of children's diseases. The city is divided into fifty districts, having an average of between 4,000 and 5,000 pupils in each. It is the

(1) New York Medical Record, May 1, 1897.
(2) Miss Dora Keen, "Medical Inspection of Schools," Report of Com. of Ed. 1897-98, page 1502.
(3) Report of Board of Education, Chicago, Nov. 1 and 15, 1899, pp. 153 and 160 ff.

duty of the inspector to visit the schools daily in the morning and examine all pupils returning to their classes after an absence of four days or more, and all who exhibit any tendency toward fever or soreness of the throat. The pupils needing examination are retained in the office of the principal until the inspector arrives and examines each one separately. In cases of sore throat cultures are taken and sent to the bacteriological laboratory of the health department, and the pupil is sent home with instructions to return the next day, by which time the culture has been examined and the principal notified what disposition to make of the child.

The results of the work from January 8 to May 1, 1900, are as follows:

Seventy-six thousand eight hundred and five examinations were conducted during that period, and 4,539 cases of infectious diseases were excluded from schools; 711 cultures were taken. Out of the total number of 76,805 examinations, only one law suit resulted, and in this the court decided in favor of the board of education. (1)

	Jan.	Feb.	Mar.	Apr.	Total.
Diphtheria	94	41	27	8	170
Scarlet fever	165	104	80	52	401
Measles	199	135	224	90	648
Whooping cough	12	14	17	12	55
Chicken pox	184	217	200	69	670
Tonsilitis	318	164	145	62	689
Mumps	164	361	432	203	1,160
Purulent sore eyes	20	13	15	7	55
Impetigo	65	53	54	21	193
Pediculosis	77	73	68	22	241
Ringworm	27	21	19	9	76
Eczema	13	13	14	8	48
Other diseases	41	33	39	20	133
Total exclusions	1,379	1,242	1,334	584	4,539
Total No. of pupils examined	18,155	23,388	24,914	10,348	76,805
No. of inspectors reporting	49	49	49	49	49
No. of cultures taken	140	240	257	74	711

BROOKLINE, MASS.

December 10, 1894, the board of education voted to employ a sufficient number of physicians to make daily inspections of the schools. Six inspectors and four substitutes were at once appointed. All accepted, were assigned to schools, and on the 11th all were at their posts. Their duty was to examine only such pupils as the teachers thought to be ill, and to give advice as to the disposal of sick children. Superintendent Dutton, in a letter to the writer, under date of October 23, 1899, says:

"Except in cases of contagious diseases, these visits are not made very frequently, but during the past few weeks, when we have had some diphtheria in the town, there have been daily inspections in all our schools.

(1) Report of Board of Education May 16, 1900.

If anything suspicious is discovered the matter is referred to the attendant physician, and in the case of sore throat cultures are taken and submitted to the bacteriological department, which is under the direction of the board of health of the town."

CAMBRIDGE, MASS. (1)

In 1894, at the request of the school committee, the board of health appointed a physician, whose duty it is to examine all cases of contagious diseases reported, and to exclude such pupils as in his opinion will endanger the health of others. He also issues all certificates authorizing such children to return to school. On February 26, 1896, as a further precaution against contagious diseases, the board of health established a system of medical inspection of children in the schools. The city was divided into six districts and a physician appointed for each to inspect the schools daily. They began their work on April 6, 1896. In May an additional inspector was appointed for the parochial school.

It is the duty of the inspector to examine only such children as are indicated to him by the teacher as having complained or as appearing to be suffering from disease, and the principal is to dispose of the pupil as the inspector may recommend.

The physician must not recommend the employment of any special physician or mode of treatment for any particular case. In cases of nearsightedness or other trouble with the eyes, or deafness, or other ear trouble, to which attention has been directed by the teacher, the physician is instructed to suggest that the principal recommend to the parents that the eyes or ears of the pupil be examined.

The report for the year ending December 31, 1896, shows the diseases and number of cases discovered in the schools since the inspection began as given below: (2)

Chicken pox	20
Chorea	1
Diphtheria	7
Erysipelas	1
Measles	11
Mumps	10
Pediculosis	13
Phthisis	1
Scarlet fever	15
Syphilis, congenital	1
Whooping cough	21
Diseases of the ear	4
Diseases of the eye	7
Diseases of the skin	18
All other diseases	41
Total	171

(1) Report of School Comm. Cambridge, 1898, page 42.
(2) Report of Board of Health, Cambridge, 1896, page 7.

ST. LOUIS. (1)

Dr. Hamon, in accordance with the wishes of the hospital alumni of St. Louis, secured the co-operation of the school board of St. Louis in making a trial inspection of twelve schools. With the assistance of others of the society, who gratuitously rendered their services, daily inspection of these twelve schools was made during the months of October, November and December, 1898. The teachers sent the pupils whom they thought to be ailing to the principal's office at a stated time, and the physician appointed for that building examined them in the presence of the principal. These twelve schools had an average daily attendance of 9,586 pupils. Nearly 17 per cent. of these, or 1,601, were found to be ill; 156 were recommended to be sent home.

The diseases reported were classed as follows:

Specific infectious diseases	76
Oral and respiratory tract diseases	787
Ear diseases	37
Eye diseases	382
Skin diseases	45
Miscellaneous diseases	274

PHILADELPHIA. (2)

On June 7, 1898, the bureau of health—

Resolved, That the medical inspector be directed to have the fifteen assistant medical inspectors visit one public school each day in their respective districts, who shall inspect each school according to the methods now employed in Boston, New York and Chicago.

The system thus instituted was not found to be very satisfactory, and a new plan of visitation was arranged and put into operation in January, 1900. The board of education selected 300 physicians from a larger number recommended by the deans of the medical colleges, the authorities of the hospitals and citizens, and assigned them to the various schools. It is their duty to make visits to the schools of their respective districts between 9:30 and 10 each morning, and inspect such children as the principals shall bring to them. A child having or threatened with any disease that is contagious or infectious is sent home with instructions to the family to consult a physician, and it will not be received back into the school without a certificate stating that it is safe to do so, signed by a medical inspector of the bureau of health. If a child requires medical treatment for other complaints a notice is sent to the family with such advice. The work for the present is being done without remuneration, but it is hoped by the authorities that when the time comes for appropriations fair compensation will be paid for the service.

(1) Dr. Hinchey, "Medical Inspection of Schools," Med. Fortnightly, 1899, page 360.

(2) Medical Record, January 13, 1900.

The Medical Fortnightly of April 10, 1900, is authority for the statement that good results are being accomplished, and that "medical men have fairly tumbled over each other and over themselves to secure appointments as inspectors."

MILWAUKEE. (1)

In January, 1900, the city being threatened with an epidemic of diphtheria, scarlet fever and measles, the board of school directors invited the health commissioner to advise with them as to the best methods to check the spread of these diseases. After full discussion the matter was placed in the hands of the health department, as the city charter contains a provision empowering the commissioner to take such measures as he may deem advisable in emergencies of this nature. He thereupon added seven physicians to his staff, making in all twelve. These doctors were assigned to certain districts and instructed to visit the public schools daily. Much good was thereby accomplished by lessening the number of cases of infectious diseases, and thereby preventing an epidemic.

The results of these examinations of school children for three months, beginning with January 23, are shown in the following table:

Total number of school days	61
Total number of pupils examined	22,525
Total number of males	10,666
Total number of females	11,859
Average number examined daily	369
Number found sick with diphtheria	4
Number found sick with measles	275
Number found sick with scarlet fever	67
Number found sick with whooping cough	16
Number found sick with other ailments	3,676
Average daily found sick from all causes	66

The report urges the importance of having a competent physician officially appointed by the board of education as medical inspector, whose duty should be to devote his entire time to the work.

OTHER CITIES.

In Paterson, N. J., medical inspection was instituted November 30, 1900. The medical inspectors are appointed by the board of education and must report to the board each month. They are under the control of the board of health, and must report to them each week as to the number of cases inspected, the nature of diseases, etc. They are appointed yearly and receive an annual salary of $250. They must report to each school at 10 a. m.

A volunteer system of daily medical inspection was instituted in the schools of Minneapolis in 1901. Medical inspection is confined to acute cases. The inspector advises the return home of non-contagious cases at his discretion, orders the dismissal of contagious cases or of infected families, examines children in rooms infected or in danger of infection, etc. The system is reported as being satisfactorily successful as a beginning.

(1) Report of School Directors, April 30, 1900, pp. 353-355.

In January, 1902, by permission of the board of education of Detroit, a system of medical inspection was instituted under the direction and control of the board of health. A physician is assigned, without remuneration, to each school. The physician reports at the opening of school each morning and examines all pupils who have been absent, or those whom the teachers present for examination.

The board of education of Lincoln, Neb., in December, 1901, arranged a system whereby the public schools of the city should receive competent voluntary medical inspection. The inspectors serve without pay and make daily visits to the schools between the hours of 9:30 and 11 a. m. The board of education divides the city into two districts and appoints a chief inspector for each district. The chairman of the board of health and the two chief inspectors constitute a board of medical inspection. The board of education appoints the inspectors. Thus the system is kept under the control of the school board.

Newark, N. J., has twelve medical inspectors, who make daily visits to the schools between the hours of 9 and 11 a. m. each school day. They make daily reports to the board of health, and on the last school day of each week they are required to fill out a weekly report for each school and send the same to the board of health. Duplicate reports are also sent at the same time to the board of education. "Inspectors shall not under any circumstances prescribe or suggest treatment or in any manner interfere with the attendance of the family physician."

The beneficial effect of medical inspection in lessening the number of cases of scarlet fever and diphtheria in Chicago is shown in the following table, compiled from the reports of the Chicago health department for the year preceding medical inspection and the first year under such inspection: (1)

	1899.				1900.			
	Diphtheria.		Scarlet Fever.		Diphtheria.		Scarlet Fever.	
	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
January ...	381	82	306	26	572	111	805	48
February ..	307	62	377	41	362	88	505	47
March	284	55	522	68	315	82	435	21
April	240	56	507	71	229	67	303	19
May	266	55	512	68	230	58	338	26
June	248	63	370	43	211	58	207	18
July	174	47	269	20	158	41	142	10
August	235	60	256	28	103	33	92	2
September..	241	75	327	31	187	42	107	4
October ...	489	93	747	35	306	79	160	13
November..	608	92	888	53	317	72	170	6
December .	458	103	719	49	313	66	211	12
Total.....	3,931	843	5,800	533	3,303	797	3,475	226

(1) "School Medical Inspection in Chicago," by W. D. Byrne, M. D. Reprint from The Journal of the American Medical Association, Nov. 23, 1901.

Says Dr. Byrne: "It is thus seen that a decrease in the number of diphtheria cases was 628 for the year, with 46 fewer deaths. In scarlet fever the decrease in cases was 2,325, with 307 fewer deaths.

"These figures make even a better showing when it is considered that physicians, as a rule, were more careful in 1900 to report cases of this nature to the health department than in previous years, and the rapid growth of Chicago must also be taken into consideration. These facts add much to the excellent results shown in the foregoing table."

TUBERCULOSIS IN TEACHERS.

In treating this subject the health of the teacher should not be ignored. A teacher physically unable for the work ought not to be in the school room. One afflicted with any form of tuberculosis should not be allowed to be housed in the same room, day after day, with children. It is an admitted fact that tuberculosis is infectious. If this rapidly increasing disease is to be stamped out, or even checked, we must prevent its spread. No teacher ought to be employed who might in any way endanger the health of those committed to her care.

EXPENSE.

The matter of expense is an important item in the consideration of any innovation. In Boston the medical inspector's salary is $200 (1) a year, and the average number of pupils in each district is about 1,400. In New York each inspector is paid $300 a year with a larger number of pupils to examine than in Boston. The chief inspector receives $2,500 a year. In Chicago (2) the salary of inspector is not to exceed $50 a month with an average of some 4,000 to 5,000 pupils in his district. The amount of salary should be regulated according to the amount of time the inspector is required to spend in performing his work. It can necessarily only occupy a part of the physician's time, and as it comes regularly at stated times, it need not demand the same amount of remuneration as the rest of his professional work. Often young, though competent, members of the profession would be glad of the opportunity at a comparatively small salary. The plan ought to work as well in small cities and towns as it does in large ones. The benefit would be as great in proportion to the number of inhabitants and the services of members of the medical profession would be as easily secured.

OBJECTIONS.

Thus far in this country there have been but few if any objections urged against medical inspection. In Germany some physicians have objected on the score of favoritism and that creating a special class of school physicians interferes with the business of the regular practitioners. Many teachers in

(1) Durgin, Paper read at annual meeting of Mass. Med. Society, June 9, '97.
(2) Report of Board of Education, 1899, page 162.

Germany seem to think that it interferes with the regular work of the school. Objection has also been made by some on the grounds of unwarranted interference with individual liberty. In 1899 the Teachers' Association of Hanover-Linden (1) adopted resolutions recommending a modified system in which the medical inspection should be accomplished without its being in connection with the school except when recommended by the teachers. This is practically what is accomplished in Boston and other American cities; for the children are here referred by the teacher to the school physician by being sent to a room specially provided for the purpose.

Most of these objections are of such a trivial character that they seem to need no answer. To those urged by the teacher it is well to observe that the fault seems to lie in the plan rather than in the idea itself. Medical inspection is a comparatively new thing and doubtless the plans that have been pursued so far are perhaps not the best that may be devised. All agree that sanitary supervision is necessary. I see no good reason for the school physician to be required to spend part of his time in the school room while the recitations are being conducted as is required in Wiesbaden. Experience will doubtless soon suggest a universally acceptable plan for carrying on the work.

CONCLUSIONS.

The system of medical inspection of schools should be under the control of the Board of Education. It should be a department of the school system, and only related to the Board of Health as the two bodies may be of mutual benefit in performing their respective functions. It would be less liable to interfere with any other department of the school system, and be free from the vicissitudes frequently incident to the Board of Health from political changes. It would be more liable to become a factor of the school system, assisting the teacher in determining the physical condition of all defective children, thereby enlarging its sphere of usefulness.

The question of taking care of the pupils who are reported as sick till the inspector comes, is an important one. To place the sick pupils together in one room and thereby expose each to the contagion of the other, seems objectionable. It seems best to send the pupil having symptoms of contagion to his home, and for the inspector to make the examination there.

By daily medical inspection of the pupils diseases are detected in their incipiency and therefore most easily dealt with, and, in cases of infectious diseases, they can be isolated. The treatment of diphtheria with anti-toxin, it is well known, should be as early as possible to insure success. In November and December of 1898, in the city of Chicago, there were 219 cases of diphtheria treated with anti-toxin. Of these nine cases died, but there were no deaths among those treated on the first or second day. Medical inspection of school children is the best means of preventing disease. It should be the aim of the medical profession to prevent sickness as well as to cure

(1) Ped. Sem., Vol. VII., April, 1900, page 86.

the sick, and by doing this the profession is attaining its highest ideal. Medical inspection is truly prophylactic work, and when it is once well established our physicians will be able to broaden their field of usefulness by the more careful study of the growing body in relation to exercise and education. The field is a practical one and is worthy the ambition of the best talent of our race. What has been accomplished in science in recent years bids us hope that the questions which perplex us now ere long may become as clear as day, and we shall go on in the pursuit of higher and nobler ideals.

It would be asking too much of the teacher to be able to diagnose the cases of disease which appear before her. This requires medical skill and can only be properly done by regular physicians.

It should be the duty of the school physician to assist the teacher in determining how much work each pupil should undertake. In periods of rapid growth, care must be had not to unduly irritate or depress by inappropriate tasks the nerve centers so as to produce various forms of neurotic diseases. The protection of the growing brain from misdirected work is a difficult task and an appropriate undertaking for medical skill. The comparatively recent researches in biology throw much light on the order of brain growth and render it plausible that further investigations may enable the skillful physician to determine more definitely this important point.

The prevention of disease and physical disorder is a public blessing, particularly the prevention of the spread of contagious diseases. It requires time, energy and skill on the part of some one to accomplish this end. The public purse ought to pay for that which is a public benefit.

Medical inspection would be a valuable benefit to a community in directing the people to sanitary measures which they would practice in their homes by reason of having their attention directed to them. It would be educative by spreading among the people more generally a knowledge of the common laws of health.

Disease not checked or prevented in children is what makes dependents in adults. Our country is burdened with the insane, the feeble-minded, the deaf and dumb, the blind, the epileptic, orphans and paupers. Ohio is a fair representative of the states. There were spent in Ohio in 1894 for charities $4,175,915.47. The income of all the colleges of the state for 1896-97 amounted to about $1,000,000. Over four times as much was spent on charities as for higher education. Education is nothing without health and a physical constitution. It is high time that we strike a blow at the root of all this defectiveness. One does not wonder at the condition of adults when he reflects on the percentage of defectives among children. Strong, robust, healthful childhood would prevent much of this inability in adult life. The cost of medical inspection is but a bagatelle compared to the good it would accomplish in mitigating suffering and making those self-supporting who otherwise would probably be objects of charity. We spend millions in taking care of these dependents. Would it not be true economy and equally just and appropriate to care alike for all children, who show beginnings of spinal curvature, defective vision or hearing, signs of consumption, or symptoms of nervous diseases of

every kind? These diseases detected in their incipiency could generally be cured, but they are of such a nature as to require medical skill for their detection.

Chronic diseases of all kinds often have their beginnings in environment. It requires a bacteriologist to detect the germs of disease. The state which provides a place for the assembling of children and does not provide for the prevention of contagion or any other disease, the germs of which could be detected by a competent expert, is morally responsible.

Compulsory attendance at school is fast becoming the law of the various states. We are thereby often requiring a child to attend school when he possesses some physical defect of sight, hearing or other bodily ailment, of which he is not aware, but which makes school life distasteful and a burden, and which might be easily detected and cured by a skillful physician. The state should demand attendance at school on the part of those for whom the schools exist, but it should also see to it that no child blindly suffers from a defect that could be cured.

A child physically defective so that he can not succeed well with his studies and gets behind his class grows to dislike school, and if his moral training is not of the highest standard he becomes a truant. It would be better to prevent dislike for school and truancy than to have truant officers and reformatories. It is better to lead the child in the right way by skillfully correcting all physical or mental defects and surrounding him with the proper environment than to build walls of prohibition and costly state penitentiaries. Do not wait till a criminal is made to reform him. Train him so he can not become one. Truly much is being done for the education of children, but much more can be done. The cost of a system of medical inspection would be more than saved in the lessened cost of the care of adult criminals and dependents.

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